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ABSTRACT

The following are among the 51 papers and 7 poster sessions included: "Agriculture in the Classroom" (Hillison); "Effects of an Elementary Agri-Science Program on Student Perceptions of and Performance in Agriculture and Science" (Howell); "Current Status of Preservice Teacher Education Programs in Agriculture" (Swortzel); "Problems and Challenges Associated with the First Years of Teaching Agriculture" (Mundt, Connors); "A Comparison of Attitudes of Students, Parents, and Counselors toward Agriculture and Agricultural Education" (Dyer, Osborne); "Comparison of Attitudes toward Agriculture of Urban High School Students by Agricultural Education Enrollment Status, Minority Status, and Gender" (Talbert); "Ethics and Agricultural Education" (Foster); "Changing the Opportunities Provided for Cognitive Processing in College of Agriculture Classrooms" (Whittington, Bowman, Tirima); "Comparing Academic Rigor in On-Campus and Off-Campus Courses" (Miller, Shih); "Relationships between Instructional Method and Critical Thinking in a Turfgrass Management Course" (Houser, Huff, Radhakrishna); "Effects of World Wide Web Instruction and Traditional Instruction and Learning Styles on Achievement and Changes in Student Attitudes in a Technical Writing in Agricommunication Course" (Day, Raven, Newman); "Assessment of College Achievement of Incoming Students to the College of Agriculture at the University of Idaho" (Touchstone, Riesenberg); "Demographic Characteristics of Preservice Teacher Education Students and Their Reasons for Majoring in Agricultural Education" (Swortzel); "Laboratory Safety Inservice Needs of Texas Agricultural Science Teachers" (McDonald, Lawver); "Implications of Integrating Science in Secondary Agricultural Education Programs" (Thompson, Schumacher); "Method of Reinforcement and Student Gender" (Johnson, Wardlow, Franklin); "Perceptions and Attitudes of

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Northwest Agriculture Instructors towards the Use of Computers in Agricultural Education Programs" (Nordheim, Knight, Connors); "Differences in Learning Styles of County Extension Faculty in Florida Based upon Selected Personal and Organizational Characteristics" (Baker et al.); "Perceived Existing and Desired Management Systems of the Mississippi Cooperative Extension Service and Their Relationship to Employee Motivation" (Sadighi, Raven, Taylor); "Profile of the Program of Activities Use by FFA (Future Farmers of America) Chapter Advisors" (Torres, Dormody); "Predicting Student Achievement in Agriculture Courses Delivered by Videotape" (Miller); and "Teaching Evaluation Skills Using Experiential Learning" (Wulff-Risner, Steward). (MN)

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Proceedings of the

1997

National Agricultural Education Research Meeting

Creating the Future Through Research

Volume XXIV

December 10, 1997
Las Vegas, NV

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In Cooperation With The
American Association for Agricultural Education
Research Committee

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Peer Review Process

For the past 24 years the National Agricultural Education Research Meeting (NAERM) has been the primary vehicle through which reseach in agricultural and extension education has been disseminated to the profession. Agricultural education professionals from throughout the United States and around the world submit their most recent research for presentation at the annual research meeting.

Each paper that is received is sent to three teacher educators in agricultural education a part of the blind review process. Only those papers that receive favorable reviews are accepted for presentation at NAERM and publication in the proceedings of the meeting. During June of 1997 there were 95 papers submitted for consideration, an eight percent increase over 1996. A distinguished group of 53 researchers served as reviewers for the papers.

Based on the reviewers' recommendations, the top 46 papers were accepted for presentation at the 1997 NAERM. An additional five papers were selected as alternates for inclusion in the proceedings. The review process resulted in an acceptance rate of 48% for papers presented and 53% for publication in the proceedings.

Preface

As the National Agricultural Education Research Meeting approaches its silver anniversary it is fitting that the theme for the 1997 NAERM be *Creating the Future Through Research.* As agricultural education researchers, it is important that we consider how research can be used to improve agricultural education for the 21st century. For the first time, the National Agricultural Education Research Meeting is being held under the direction of the AAAE Research Committee. This new committee has accepted the responsibility for providing leadership to research initiative within AAAE, including the annual research meeting. Members of the AAAE Research Committee for 1997 include:

Acknowledgements

The National Agricultural Education Research Meeting requires the efforts of hundreds of dedicated agricultural education professionals. NAERM could not be held without the paper reviewers, concurrent session chairs, discussants, facilitators, and especially the researchers who conducted and submitted their research for presentation at the annual meeting. The Co-Chairs would like to extend our thanks and appreciation to all the individuals who volunteered their time and talents to this year's NAERM. We would also like to acknowledge the faculty and staff of the Department of Agricultural and Extension Education at the University of Idaho who worked many hours to ensure a successful research meeting. Special thanks goes to Dr. Lou E. Riesenberg, Department Head, Ms. Marilyn Crumley, Administrative Assistant, and Victoria Seever, Secretary.

Previous Meetings and Chairs

Without the dedication of these Chairs, NAERM would not be the success it is today.

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Hollie Thomas	Florida State University	1975	Anaheim, CA
Glen Shinn	Mississippi State University	1976	Houston, TX
William Richardson	Purdue University	1977	Atlantic City, NJ
Bennie Byler	Mississippi State University	1978	Dallas, TX
Ronald Brown	Mississippi State University	1979	Anaheim, CA
L.H. Newcomb	The Ohio State University	1980	New Orleans, LA
Maynard Iverson	North Carolina State University	1981	Atlanta, GA
Dale Oliver	Virginia Tech State University	1982	St. Louis, MO
Paul R. Vaughn	New Mexico State University	1983	Anaheim, CA
Jimmy Cheek	University of Florida	1984	New Orleans, LA
Bob Stewart	University of Missouri	1985	Atlanta, GA
Alan A. Kahler	Iowa State University	1986	Dallas, TX
Alfred J. Mannebach	University of Connecticut	1987	Las Vegas, NV
Edgar. P. Yoder	Pennsylvania State University	1988	St. Louis, MO
Michael F. Burnett	Louisiana State University	1989	Orlando, FL
Robert A. Martin	Iowa State University	1990	Cincinnati, OH
Larry R. Arrington	University of Florida	1991	Los Angeles, CA
John P. Mundt	University of Idaho	1992	St. Louis, MO
Dennis Scanlon	The Pennsylvania State University	1993	Nashville, TN
Thomas H. Bruening	The Pennsylvania State University		
David E. Lawver	Texas Tech University	1994	Dallas, TX
Robert Terry, Jr.	Texas A & M University		
Leon G. Schumacher	University of Missouri	1995	Denver, CO
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Concurrent Session A

Theme:
Agricultural Literacy

Chairperson:
Tracy Hoover
University of Florida

Discussant:
David L. Howell
Univ. of New Hampshire

Facilitator:
Marty Frick
Montana State University

Agriculture in the Classroom: Early 1900s Style
John H. Hillison, Virginia Tech

Effects of an Elementary Agri-Science Program on Student Perceptions of and Performance in Agriculture and Science
Cary Trexler, Michigan State University
Murari Suvedi, Michigan State University

The Cheeseburger Came from Where?: Elementary School Student's Understanding of How Food Is Affected by Biology and Climate
Cary Trexler, Michigan State University

The Effects of an Agricultural Literacy Treatment on Participating K-12 Teachers and Their Curricula ....
Mark A. Balschweid, Oregon State Univ.
Gregory W. Thompson, Oregon State Univ.
R. Lee Cole, Oregon State University

Agriculture In The Classroom: Early 1900s Style

John H. Hillison
Virginia Tech

Introduction and Theoretical Framework

Former United States Secretary of Agriculture John Block was a strong advocate of literacy, particularly of agricultural literacy. With his support, a primarily elementary program emphasizing agricultural literacy called Agriculture in the Classroom was started in 1981. Since that time Agriculture in the Classroom has been utilized to some extent in all 50 states. However, while Agriculture in the Classroom has been very successful, it did not mark the beginning of agricultural instruction at the elementary level. Such instruction actually began in the early 1900s or even earlier.

Garland Bricker (1911) reported on the popularity of agriculture at the elementary level 70 years before Secretary Block advocated the most recent use of it.

> Like the more popular sciences such as botany, physics, physiology, and chemistry, agriculture has its common, everyday, elementary facts with which every one (sic) in country and village should be more or less acquainted. Such facts are: the proper time for planting seeds and for harvesting crops; the appearance of the various stages of development; the different kinds of soils; the use of manure; the structure and use of the common tools used on the farm and in the garden; the phenomena of the souring of milk, and the ripening of cream; the churning of butter; and a thousand and one other things common to ordinary farm life.
>
> The foregoing will suggest a field for the work in elementary agriculture, or nature-study, in the elementary school. (pp. 1-3)

The instruction of agriculture in elementary schools had grown to the point that by 1915 Monahan and Lane could report that 21 states required such instruction in rural schools, and half required such instruction in urban schools. The states were Alabama, Arkansas, California, Florida, Georgia, Indiana, Iowa, Louisiana, Michigan, Mississippi, Missouri, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Tennessee, Texas, West Virginia, Wisconsin, and Wyoming (p. 295).

It was one thing to mandate instruction of agriculture in elementary schools, but it was something else to develop a curriculum and the activities that could go with that curriculum. What educational philosophy should be emulated? How should teachers be trained for this new emphasis on elementary agriculture?

Purpose and Objectives

The purpose of this study was to document the instruction of agriculture at the elementary level in the early 1900s. The following specific objectives were accomplished:

1. Identify the curriculum used to provide instruction in agriculture at the elementary level.
2. Identify the uses of projects for elementary agricultural instruction.
3. Identify the uses of nature-study for elementary agricultural instruction
4. Determine the type of training provided for teachers of elementary agriculture.
5. Draw conclusions for the contemporary Agriculture in the Classroom program from the early elementary agriculture program.

Methods and Procedures

Historical research methods were utilized to accomplish the objectives of the study. Both primary and secondary sources were utilized to obtain the information needed. Primary sources included books, journal articles, and bulletins. Secondary sources included magazines. Information was collected at numerous sites including the Library of Congress, National Education Library, National Agriculture Library, and various land-grant university libraries. All references were subjected to both internal and external criticism.

Results and/or findings

Elementary Agriculture Curriculum

An example of the early elementary agricultural curriculum can be found in Arkansas. The Arkansas Department of Education advocated a uniform approach for providing instruction for elementary agriculture. The Department advocated using four divisions for grade levels. The first division was composed of pupils in the primary and first grades; the second division was composed of second, third, and fourth grades; the third division was composed of pupils in the fifth and sixth grades; while the fourth division was composed of pupils in the seventh and eighth grades (Twenty-Second, 1911-1912). Showing the influence of the Swiss educator Johann Pestalozzi, the Arkansas Department of Education did not advocate the use of textbooks until the fourth division was reached. "The field, garden, woods, roadside, all should be the text book and laboratory" (p. 245).

The Arkansas recommendations went on to establish themes for instruction centered around plants and animals. Specific examples included suggesting that primary and first grade students study parts of plants such as roots, stems, and branches. Students at this age could study birds and pets to fit the animal theme. The study recommended that second division students study the functions of plant parts and learn the uses of specific animals such as poultry, meat, and feathers. Third division students could conduct experiments in growing cuttings in water and sand as well as classifying the uses of horses, cattle, sheep, hogs, and goats. Fourth division students should have more depth on the same topics of study than the first three division students. In the spring, fourth division students could learn about seed germination and preparation of seedbed. For fall the older students could learn about markets and seed selection (Twenty-Second, 1911-1912).

The United States Department of Agriculture, along with the Virginia Department of Public Instruction and the Virginia Agricultural and Mechanical College (VPI), issued a publication by E. A. Miller in 1918 entitled Elementary Agriculture for Virginia Schools. The introduction for the publication stated

> Purpose -This publication presents a series of lessons in Elementary Agriculture for the public schools of Virginia. The lessons are outlined after a monthly sequence plan and are designed to meet the needs of the public schools of the State. It is hoped that by presenting these lessons at the time the

> principles are practiced, or should be practiced on the farm, two things may be accomplished, namely: the classroom work will be greatly vitalized by having timely material at hand for practical work, and the things that are best to do on the community farms will be taught at a seasonable time. (p. 5)

The publication went on to suggest that teachers procure references and bulletins from Virginia Polytechnic Institute and the United States Department of Agriculture. It was also suggested that if at all possible a school garden be established in order to put into practice things learned in the classroom. The Virginia publication had the thematic approach of the Arkansas recommendations. Virginia teachers were encouraged to follow the themes of soil, crops, hogs, the orchard, vegetable gardening, poultry, farm animals, and crops as appropriate on a monthly basis. An example of such a recommendation for September on the theme of cover crops was the topical outline of purpose, kinds of cover crops, dates of seeding, rates of seeding, methods of seeding, and inoculation. These topics were followed by suggested references and activities (Miller, 1918).

Experienced agricultural educators can identify both the scientific method and problem solving showing through the above suggestions. Other educators advocated the use of agricultural subject matter for curriculum integration with academic subject matter. One such example was the recommendation by M. A. Leiper of the Western Kentucky State Normal School in 1912 to teach language through both agriculture and domestic science. Leiper's main concern was the general inadequacy of rural elementary schools as compared to urban elementary schools.

> The teacher in the rural school undertakes a difficult task when he attempts to lift his school to the standard outlined. The consolidated school may attack the problem with reasonable hope of solution, but for the teacher in the one-room rural school, confronted with the necessary schedule of from 20 to 30 classes each day, the situation is far more serious. For him the solution must be found largely in correlating the necessary instruction in the practical fields of nature study, agriculture, and domestic science . . . . (pp. 7-8)

Leiper went on to make specific suggestions such as having conversation exercises for developing oral skills in the early grades where students could describe home life and pictures displayed in the classroom and by the teacher. Another example of a suggestion was the use of observation reports where students would observe something at home and having an assignment at school to give either an oral or written report on the observation. He also recommended instruction in narration, essay, and description, all incorporating agricultural examples. In addition, teachers were given several suggested references, such as: Feeding Her Birds, Shoeing the Bay Mare, The Village Blacksmith, and Oxen Going to Work.

Florence Fox (1921), a specialist in educational systems for the United States Bureau of Education, recommended several ways to integrate agriculture with other subject matter at the elementary level. For example she recommended teaching history with such agricultural topics as Cortez introducing wheat into Mexico and the Pilgrims discovering corn. She suggested teaching about historical animal life with the horse in Mexico, the sacred cow in India, the Pilgrim's turkey, and wild honey and beeswax. For an area described as stories, poems, and supplementary reading Fox, had a lengthy list of recommendations that included Little Red Hen, Story of Joseph , Redheaded Woodpecker, Black Beauty, King Solomon and the Bees, The Friendly Cow, The Three Little Pigs, and Children of the Plains (p. 29). She also shared integration ideas for nature-study and art.

Projects

In the Pestalozzian mode several projects were recommended by experts of the day that utilized agricultural content for elementary instruction. These recommendations were occurring at about the same time high school agricultural education programs were also using the project method as way to teach content.

An example of the project approach was advocated by Miller (1918). He suggested using apple sorting as a project activity. Students could use a scorecard for grading apples and compare their score to the correct score established by some authority. The second step for the project activity was to have students integrate agricultural content with academics by preparing apple scorecards for language skill development, making a sketch of the apple sorting table for art, and determining the total barrels of apples produced in their community for arithmetic.

Another example advocated by Miller was one of having students observe two chickens. One chicken should be laying and the other should not be laying. The students should report the differences between the two for language development. For geography skills the students should use a map to point out markets for poultry and poultry products. For arithmetic skill development students should secure facts at their home for poultry sold that month.

Biological principles could be taught by a project method suggested by the Superintendent of Instruction in Arkansas in the Twenty-Second Biennial Report (1911-1912).

> 1. Have each pupil bring to school an ear of corn in the shuck. 2. Look closely at the outer ends of the silks. 3. Carefully remove the shuck without disturbing the silks. 4. Trace several silks to see where the other ends are. 5. How does the number of silks compare with the number of kernels. 6. Do you know which appears first, the silks or the pollen? 7. Do you know any relation between the pollen and the silks? 8. Will a stalk of corn grown some distance from other stalks probably have well-filled ears? 9. What is mixed corn? 10. What causes mixed corn? (p. 82)

Building a farm on a sand table was a project advocated by Fox (1921). She described numerous ideas for such a project.

> The building of the farm on the sand tables is a project which has been frequently used in primary and kindergarten schools as a center of interest in the daily program. Such a study is rich in subject matter. From the art side it offers a wide field of selection. It possesses also a broad historical background and a voluminous literary content and presents numberless opportunities for the presentation of problems in nature study.
>
> The activities of the farm are varied and suggest many projects for the primary grades. These farm problems make an especial appeal to the child because his larger interest in life lies in the matter of feeding. A close connection is easily formed between this interest in his consumption of food and the activities that produce it, and this affords most excellent material for the problem-project type of instruction. (p. 28)

Gardens and gardening proved to be popular projects and ways for elementary students to learn about agriculture. Miller (1918) recommended teaching about gardening in March. His recommended topics included work in the hotbed, preparing the garden soil, planting early vegetables, and transplanting. From a project perspective he advocated having the garden at home. However, most of his ideas could have worked at a school garden as well. For practical exercises he recommended having Tomato Club members sowing seeds in hotbeds. For non-Tomato Club members he recommended having them grow at least a small plot of garden at home or at school. His ideas on content integration involved having students make sketches of their gardens (drawing) and doing arithmetic problems that involved seed population and crop yield.

A 1919 publication from the United States Commissioner of Education reported the popularity of gardening projects. The commissioner suggested three reasons for their popularity. One was the shortage of

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food caused by World War I, a second was the recognition by school officials of the educational value of gardens, and the third was emphasis given to gardens by the National Government. The publication noted that gardens were especially popular in urban areas, where the food shortage had been most keenly felt. The United States Bureau of Education had attempted to help the situation by sending posters, class lessons, record blanks, and insignias to local schools. An army known as the United States Garden Army was established to encourage more children to participate. Total enrollment in the gardening program in states and territories ranged from 210 in Wyoming to 284,977 in Illinois. It was also reported that the United States Department of Agriculture had primary responsibility for children's gardening instruction through Boys and Girls Clubs in rural areas.

Jarvis (1916) provided a good summary of why gardening was an effective way of providing instruction. He noted "Most of the criticism of the school today is based upon its failure to meet the living needs of boys and girls." (p. 9) He reported that gardens were democratic in nature as they expanded opportunities, they helped obtain parental interest, and they helped obtain students' interest.

Nature-Study

Nature-study was a movement for teaching science at the elementary level that became active in the early 1900s. Much of the curriculum content was agriculturally based. Liberty Hyde Bailey (1903), dean of the Cornell College of Agriculture, described nature-study as an elementary school movement aided by university faculty. He believed the movement started between 1884 and 1890 with early usage in New York and Massachusetts primarily in reaction to "dry-as-dust" science teaching. Even though there were extensive agricultural examples used in nature-study, he also noted that it was a product of the common schools, not of scientific investigation. He wrote "Nature-study is not a science. It is not knowledge. It is not facts. It is a spirit. It is concerned with the child's outlook on the world" (p. 5). Bailey went on to note that nature-study was influenced by many great educational reformers--among them were Comenius, Pestalozzi, Emile, Rousseau, and Froebel.

Bailey also reported that there were numerous ways to teach nature-study, but it was the end result that really counted. The end result was sympathy for nature and the outdoors. From that sympathy would come the development of keen interest in every natural object and phenomenon. Such observations and interests would logically lead to a greater interest in agriculture, but not necessarily make the students agriculturalists.

> Moreover, it is not our purpose to teach technical agriculture in the common schools, but to inculcate the habit of observing, to suggest work that has distinct application to the conditions in which the child lives, to inspire enthusiasm for country life, to aid in home-making, and to encourage a general movement toward the soil. (p. 67)

Perhaps because of Bailey's support, Cornell University published a 600 page book of bulletins written by faculty members and others on the nature-study topics for elementary schools. The topics ranged from "A Handful of Soil, What It Is" to "Some Carpenter Ants and Their Kin" (Cornell, 1904).

A magazine, The Nature-Study Review, was established in 1905 by Professor M. A. Bigelow of Teachers' College, Columbia University (Nature-Study Review, 1910). The Review described itself as "Devoted primarily to all scientific studies of nature in elementary schools" (Nature-Study Review, 1910, p. 1). The movement also included a professional organization called the American Nature-Study Society.

Examples of the use of nature-study in elementary schools included the project idea of gardening. The program was recommended for the fourth grade and older. Fred Charles of the University of Illinois made such activity recommendations for the nature-study garden as experimental studies with plant varieties and fertilizers. Charles recommended the use of scientific research which could be used for both educational and agricultural principles. ". . . a thorough working knowledge of a subject, together with a thorough working knowledge of children, will make it possible for the fundamentals in almost any field of science to be satisfactorily presented in the nature-study course of the elementary school" (1910, p. 87). Charles' article went on to describe both scientific and academic principles that could be taught via the nature-study garden.

They included (a) a definite plan with a drawing of the garden to be planted, (b) good seed with instruction on viability and germination rate, (c) good soil with instruction on fertility and pH, (d) the weather and instruction on its elements, (e) good sense on such factors as marking rows and distance between rows, and (f) the theory practical instruction on agriculture can be provided at the elementary level, even if it is a very scientific field, as long as instructors understand both science and children.

Other examples of nature-study use included the study of insects. Comstock (1910) recommended using a Lubbock nest for observing ants. In addition, she recommended studying such creatures as striped cucumber beetles and the cabbage worm. Among other advantages of studying the beetle and the worm was the fact that they were generally readily available.

Ornithology was also recommended as a part of nature-study. Hodge (1910b) advocated the practice of observing passenger pigeons. Hodge (1910a) also recommended studying the bobwhite.

Prior to passage of the Smith-Hughes Act in 1917, but with rapid growth in the number of agricultural education students at the high school level, some advocated turning nature-study teachers into agricultural education teachers. Bricker (1914) considered such an idea to be a mistake. He noted that nature-study teachers instructed with no idea of building lessons into parts of a great science. He believed the teacher of agriculture should do this conscientiously. He further noted that agriculture had an economic base and that nature-study did not.

Teacher Training

In addition to the training of agricultural education teachers in the early part of the 20th century, another significant issue was on how best to prepare teachers for providing instruction in elementary agriculture. The most common source of elementary teacher training during that time was normal schools. Most educators believed that these schools should continue to be the source of elementary teachers. Many also viewed the greatest need was to prepare teachers to be elementary teachers for rural schools.

Jarvis (1921) reported that many normal schools had established a modification of their usual training to offer a specialty training for rural elementary schools. "The modification of the rural curriculum to meet the needs of the rural people necessarily means that more attention must be given to agriculture as the dominant interest of rural communities. In other words, farm life must form the basis of the course of study." (p. 23) Leiper (1912) believed that normal schools had started to do a good job of preparing rural teachers to provide instruction in elementary agriculture and that the day would soon come when all states would require such preparation.

E. C. Bishop of the State Agricultural College in Ames, Iowa agreed with both Jarvis and Leiper that normal schools would be the source of teachers. However, Bishop (1912) believed that elementary agriculture instruction should be provided in both rural and urban schools. "While we are preparing these needed teachers, we may well be working out better courses of study in agriculture, not only for rural schools but for all public schools" (pp. 53-54).

Tadd (1901) had suggestions for teachers using the nature-study concept. He criticized teachers who simply had their students look at natural objects. He wanted teachers to appeal to more of their students' senses with touching and feeling of natural objects and drawing of natural objects, which was very compatible with nature-study's typical use. "It is the performance of actions through a number of the modes of expression that calls forth powers of perception and conception and expression, and makes so vivid an impression on the brain as never to be forgotten (pp. 63-64).

Conclusions and/or Recommendations

Almost 100 years ago educators, both those with an agricultural background and those without such a background, had found that the subject matter of agriculture was a wonderful delivery system for instruction at the elementary school level. Such instruction utilized the position of some of the most respected educational philosophers such as Froebel and Pestalozzi.

The project method of instruction proved to be very successful and was used extensively. Most elementary teachers used such agricultural projects as gardens, crop products such as corn, and a sand table farm. Nature-study with its agricultural flavor was an effective way to teach science to elementary students. Nature-study utilized project-type strategy, observation, and manual activities such as drawing.

A degree of special teacher training was needed for elementary instruction in agriculture. Some argued that the instruction should be provided exclusively in rural schools, while others argued that it should be in all schools. The primary source of elementary classroom teachers was normal schools. This was equally true for elementary agricultural instruction. In the early 1900s many normal schools established a specialty area in rural instruction which emphasized agricultural instruction.

Today's proponent and user of Agricultural in the Classroom must look past the early 1980s to find its beginning. The groundwork was established in the early 1900s. That groundwork included a sound philosophical base exemplified by extensive project utilization and hands-on instruction. A significant lesson for today's user is to follow the same path. The lesson is that what was successful conceptually in the beginning of the program will still be successful today. The agricultural examples that make academic subjects interesting can also accomplish John Block's objective of making people more literate about agriculture and such basics as where their food and fiber comes from.

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Agriculture in Classroom: Early 1900's Style

A Critique

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Dr. Hillison provides us with an excellent historical perspective for today's "Agriculture in the Classroom." He has identified clear and important objectives for this study. As we recommend agriculture curriculum and projects for elementary classes today it is useful to review the agriculture curriculum and projects used to provide instruction at the elementary level in the early 1900's.

Utilizing both primary and secondary sources is important in conducting this historical research. The author is to be commended for utilizing various libraries to locate both primary and secondary sources for this study. The results and findings are presented as they relate to the objectives of the study which is helpful to the reader. The author limits his results and findings to the stated objectives. The conclusions and recommendations presented provide us with important insights identified by Froebel and Pestalozzi. It strongly supports the fact that agriculture examples are a great way to deliver instruction at the elementary level and is further supported in studies by Trexter and Balschweid. They support the conclusion that emphasis should be given today to provide training to elementary teachers in the use of agricultural curriculum which used the project method of instruction.

This study is a reminder that as we look to the future, the past is an excellent resource.

Effects Of An Elementary Agri-Science Program On Student Perceptions Of And Performance In Science And Agriculture

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INTRODUCTION

The National Research Council (1988) suggested that agriculture was too important to be taught to only those in vocational education. To teach more agriculture in the country's elementary schools, the Council suggested that:

> "Teaching science through agriculture would incorporate more agriculture into curricula, while more effectively teaching science" (p.11).
>
> "In many elementary schools, the most realistic way to teach science through agriculture is to introduce modules, or units of instruction that supplement and eventually replace existing curricula and textbooks" (p.13).

During the 1990=s, many argued that a larger audience needed to be educated about agriculture and the human food system. Agricultural educators advocate the integration of agricultural concepts into the elementary school science curriculum (Trexler and Miller, 1992; Leising and Zilbert, 1994; Birkenholz et al., 1994; Frick, Birkenholz, and Machtmes, 1995.)

Concomitant to the agricultural education's move toward redefining its audience, the American Association for the Advancement of Science (AAAS) in Project 2061: Science for All Americans (1989) called out for increased scientific literacy. The Association suggested that most Americans are not scientifically literate because:

- Few elementary school teachers have even a rudimentary education in science . . .
- The present curricula in science . . . [are] overstuffed and undernourished.
- The present science textbooks and methods of instruction . . . often actually impede progress toward scientific literacy. (p. 14)

As a result of these parallel calls to action, practitioners began to explore ways to strengthen elementary teacher understanding of science concepts and to add relevance to science by creating curriculum based on food, agriculture and the environment.

In 1991 the Sanilac County Intermediate School District (SISD) embarked upon a program to improve both scientific and agricultural literacy by creating a process for teacher capacity-building and curriculum development. Grant proposals were written to carry out their plan. In the spring of 1991, SISD submitted a proposal to the W. K. Kellogg Foundation and received three years of funding beginning February 1992. The grant's overarching goal was to increase agri-scientific literacy among elementary students. Its intermediate goals were to:

- Increase awareness of the interrelationships between science, agriculture, and the environment;

- Develop a K-6 science curriculum based on food, agriculture, and the environment; and

- Empower K-6 teachers to deliver an agriculturally-based science curriculum.

To carry out the program a teacher intervention strategy was designed and implemented. The notion was to work with teachers to develop increased knowledge and more favorable perceptions about agriculture and science. SISD hired staff with formal training and extensive practical experience in agricultural and elementary science education. The staff, in cooperation with teachers and principals, designed and conducted capacity-building activities for the rural, isolated school districts. These activities included, but were not limited to: 1) quarterly grade level inservices on science and agricultural concepts, 2) creation of a teacher-driven curriculum development process, 3) development of kits of materials, 4) updates for principals, 5) week-long summer workshops, etc.

As a result of this treatment, teachers taught nearly all state-mandated science objectives within the context of agriculture and natural resources. The K-4 curriculum included four thematic, eight-week modules supported with kits of hands-on manipulatives for each grade level. Grades five and six teachers were less amenable to curriculum integration, so more traditional curricula based on agricultural concepts were supplied. Curriculum development proceeded in the first year with grades kindergarten, three, and six. Grades two and four were introduced in the program's second year. In the program's final year of Kellogg Foundation funding, grades one and five were brought into the fold. Over the three-year period this research was conducted, 159 of the 161 treatment school teachers availed themselves of the program on a consistent basis.

THEORETICAL / CONCEPTUAL FRAMEWORK

The work of Allport (1955) and Combs and Snygg (1959) in perceptions and personal meaning set the theoretical framework for this study. Combs et al. (1976) asserted that perceptions and personal meanings give direction to individual actions, choices and behaviors. This suggested that a student's interest in learning science through agriculture may be predicted by analyzing his/her beliefs about agriculture and science. Greenwald (1989) supported this theory, reporting that individuals with positive attitudes toward a subject or situation tend to evaluate it positively.

In science education, Yager and Penick (1986) reviewed the affective portions of the National Assessment of Educational Progress for 1977, 1982 and 1984. They noted that as students move from elementary to higher educational levels, their attitudes towards science becomes less positive. Science educators argue that the isolated, disassociated, and sterile way that science is most often taught diminishes student interest in the subject (National Center for Improving Science Education, 1989; AAAS, 1993; Roth, 1995). Yager and Penick (1986) suggest that, "when we begin teaching science dynamically, as it exists in the real world, and not as a static subject in tests and the minds of many teachers, we may see different perceptions by students" (p. 362). This view is also supported by agricultural educators (Budke, 1991; Trexler, 1994; Connors and Elliot, 1995).

In agricultural education, little work has been conducted to ascertain perceptions of elementary students regarding agriculture. Despite this, Terry et al. (1992) found that elementary education student teachers with more knowledge about agriculture tend to have more positive perceptions toward agriculture.

Teaching science through the context of agriculture and natural resources is advocated by many agricultural educators in elementary as well as middle and high school. Research in elementary agri-science is limited. Mabie and Baker (1996) found that elementary students taught through experiential techniques in the context of agricultural out-performed a control group in articulating scientific process skills. Currently there is a dearth of knowledge about teaching elementary school science through an agricultural context . However, there exists some knowledge base at the middle and high school levels. Enderlin and Osborn (1991) and Whent and Leising (1988) found that students taught through agricultural examples perform at least as well, if not better, than students engaged in traditional science curricula. Connors and Elliot (1995) concluded that Ahigh school seniors who had agriscience and natural resource classes performed as well as seniors who did not have agriscience and natural resources classes on [a] science achievement test" (p. 62).

A review of literature provides the following conceptual framework for this study. The framework in Figure 1 shows how teachers in an elementary school context can influence student perceptions of both agriculture and science learning, while promoting the acquisition of agricultural and scientific knowledge.

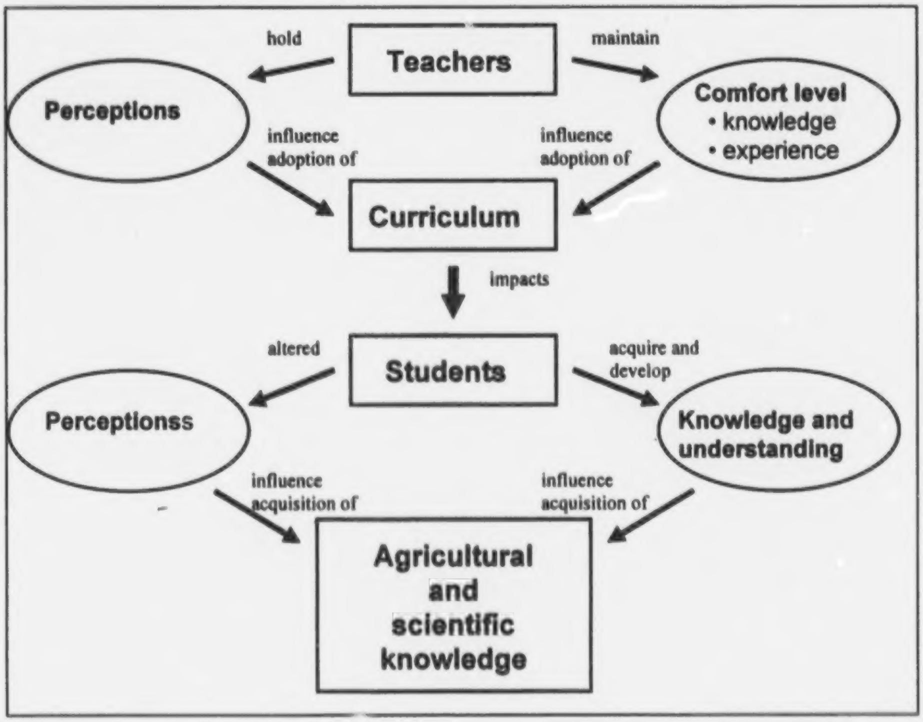
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Figure 1. Conceptual Framework for Developing Curriculum to Increase Elementary Students' Agricultural and Scientific Literacy

PURPOSES / OBJECTIVES

The study's purpose was twofold. First, it sought the perceptions of fifth grade students relative to science learning and agriculture and their knowledge of agri-science. Second, the study attempted to determine the affects of an agriculturally-based elementary science curriculum on student perceptions of science learning and agriculture as well as on their agri-science knowledge. The research questions addressed by this study were:

1) What were the 1992 perceptions of fifth grade students regarding science learning and agriculture in treatment and control groups?

2) What were the 1995 perceptions of fifth grade students regarding science learning and agriculture in treatment and control groups?

3) Do perceptions of science learning and agriculture differ between students participating in the agriculturally-based curriculum program and those not participating?

4). What was student agri-science knowledge level in both the treatment and the control group and how did it change over time?

METHODS / PROCEDURES

Population

The population for this study included all fifth grade students from eleven contiguous rural school districts in the central thumb area of Michigan . A representative sample of fifth grade students was drawn from seven Sanilac county school districts (treatment group). In order to compare student perceptions about science learning and agriculture and agri-science knowledge in similar settings, four school districts in Huron county were selected as a control. These school districts were similar with respect to school size, previous interventions in science education, community demographics, teacher educational level, economic base and per pupil spending.

Fifth grade students were selected because they were to receive three years of treatment. In addition, the Michigan State Board of Education requires this grade to take a standardized achievement test based upon the Michigan's model elementary science objectives. In 1992 there were 774 fifth grade students in these school districts, while in 1995 their number grew to 842.

Instrumentation

This study utilized a Pretest-Posttest Control Group Design (Campbell and Stanley, 1963). The researchers used Project 2061: Science for All Americans (1989), Michigan's Essential Goals and Objectives for Science Education (1991), and Understanding Agriculture: New Directions for Education (1988), the basis for the program's objectives, as a foundation for instrument development.

Data were collected via survey questionnaires. The instrument consisted of self-administered questionnaires with both closed and open-ended questions and was divided into three (3) sections. The first section, with twenty (20) questions, assessed student perceptions related to agriculture and science. The second addressed agri-science knowledge and contained twenty-seven (27) questions. The final section ascertained demographic information. The instrument was validated by staff members of the Department of Agricultural and Extension Education at Michigan State University and Sanilac ISD. Questionnaires took no more than 15 minutes to complete. A five-point Likert-type scale, with 1=never, 2=rarely, 3=sometimes, 4=usually, and 5=always, was used to measure perceptions and attitudes, while agri-science knowledge was assessed through "true-false" questions.

The instrument was field-tested to ensure usability and reliability. A Cronbach's alpha of (.60) and (.77) was determined for factors pertaining to perceptions about agriculture and science, respectively. Nunnally (1967) suggests that reliability coefficients of .5-.6 are acceptable in early stages of research. Factor analysis was conducted using the Rotation Varimax method to determine question items to be included in determining perceptions about science and agriculture. Eigen values greater than 1 were set a priori.

Data Collection

In May 1992, prior to the program's onset (prior to treatment), district superintendents and building principals were contacted to make arrangements for survey administration. Researchers administered the instrument to randomly selected 5th grade students who were stratified proportionally by school district. The researchers explained the purpose of the study to the students and stressed that all responses would be confidential. All data were collected within a one week time frame.

In May 1995, after three years of treatment, the researchers surveyed a similar group of 5th grade students whose teachers had undergone the treatment and taught them agri-science curriculum. The control group was also surveyed at this time.

Analysis of Data

Data were analyzed using the SPSS/PC+ computer software program. Frequency counts, percentages, means and standard deviations were used to describe findings. A *t* test statistic was used to determine significant differences between perceptions and agri-science knowledge, pre and post treatment, for control and treatment groups. An alpha level of 0.05 was set *a priori*. Whenever questionnaires contained incomplete items, they were treated as "missing values" and were not counted toward the sample statistics.

RESULTS / FINDINGS

Research Question One

What were the 1992 perceptions of fifth grade students regarding science learning and agriculture in treatment and control groups?

The findings of the 1992 base line study indicate that students in the treatment group schools had significantly more positive perceptions about science than students in control group schools. As shown in Table 1, learning science was "usually" fun for students, science was "usually" their favorite subject, and respondents in both groups felt that they were good science students. On a 1 to 5 scale with 1 being "never" and 5 being "always", the mean scores for these statements ranged from 3.53 to 3.75 and 3.11 to 3.35, for treatment and control schools, respectively. Students in treatment schools held more positive perceptions about science than those in control group schools. Similarly, students felt that "sometimes" science is boring to learn and being a scientist would be fun only "sometimes". Students from treatment schools had more positive perceptions about science and willingness to learn science through agricultural examples than students from control group schools.

Table 1. 1992 Student Perceptions about Science Learning

STATEMENTS	Treatment			Control		
	n	M	SD	n	M	SD
Learning science is fun.	212	3.75	.92	169	3.35	.91
Science is one of my favorite subjects to learn.	210	3.60	1.31	169	3.11	1.47
I am a good science student.	210	3.53	1.03	167	3.24	1.14
Being a scientist would be fun	210	3.50	1.32	169	3.05	1.44
I am looking forward to taking science classes in junior high and high school.	211	3.46	1.31	168	3.13	1.35
Scientific activities help me to test my ideas.	209	3.30	1.10	168	3.36	1.11
I like to learn science through agricultural examples.	209	3.21	1.21	166	2.92	1.19
Teachers encourage me to ask questions about science.	210	3.21	1.34	168	3.11	1.32
Composite score	196	3.46	.73	161	3.16	.75

Scale: 1 = Never, 2= Rarely, 3= Sometimes, 4= Usually, 5 = Always

Student perceptions about agriculture were assessed at both pre and post project periods. Mean perception scores for pre-project data are presented in Table 2. Students in both treatment and control schools "usually" believed that many agricultural jobs require an understanding of science and that research in science has improved agriculture. They "sometimes" felt agricultural jobs require much education; agriculture is more than farming and is part of science.

Table 2. 1992 Student Perceptions about Agriculture

	Treatment			Control		
STATEMENTS	n	M	SD	n	M	SD
Many agricultural jobs require an understanding of science	207	3.54	1.02	167	3.63	1.10
Research in science has improved agriculture	209	3.53	1.08	166	3.48	1.22
Agriculture is more than farming	206	3.34	1.27	162	3.23	1.43
Agriculture is part of science	210	3.31	1.01	167	3.68	1.13
Agricultural jobs require much education	209	3.16	1.27	166	3.22	1.40
Composite score	196	3.38	.62	154	3.47	.66

Scale: 1 = Never, 2= Rarely, 3= Sometimes, 4= Usually 5 = Always

Research Question Two

What were the 1995 perceptions of fifth grade students regarding science learning and agriculture in treatment and control groups?

The same instrument was administered to a similar sample of fifth grade students after the intervention, i.e., after three years. Findings on student perceptions of science are presented in Table 3. Again, students possessed a favorable attitude toward science. Findings suggest that students in both groups "usually" felt that they were good science students and that they enjoyed learning science. Further, they indicated that they "sometimes" looked forward to taking science classes in junior high or high school; felt scientific activities helped them to test their ideas and teachers encouraged them to ask questions. In general, treatment group students had a more positive perception about science than control group students.

Table 3. 1995 Student Perceptions about Science Learning

	Treatment			Control		
STATEMENTS	n	M	SD	n	M	SD
I am a good science student	236	3.66	1.07	171	3.48	1.19
Learning science is fun	241	3.64	.85	173	3.39	.99
I am looking forward to taking science classes in junior high and high school	240	3.48	2.40	172	3.16	1.40
Scientific activities help me to test my ideas	241	3.45	1.13	171	3.51	1.17
Science is one of my favorite subjects to learn	240	3.42	1.36	171	3.15	1.38
Being a scientist would be fun	240	3.30	1.40	170	3.13	1.42
Teachers encourage me to ask questions about science	240	3.25	1.35	173	3.39	1.30
I like to learn science through agricultural examples	238	3.13	1.18	170	3.00	1.20
Composite score	228	3.45	.72	163	3.28	.83

Scale: 1 = Never, 2= Rarely, 3= Sometimes, 4= Usually, 5 = Always

Student perceptions about agriculture after the project are shown in Table 4. Findings indicate that students in both treatment and control groups had positive perceptions about agriculture. After a period of three years, students in treatment schools showed slightly more positive perceptions about agriculture, whereas there was a slight decrease in mean score for the control group students. However, the change in perceptions over the three year period was insignificant.

Table 4. 1995 Student Perceptions about Agriculture

	Treatment			Control		
STATEMENTS	n	M	SD	n	M	SD
Agriculture is part of science	240	3.55	1.10	173	3.37	1.14
Many agricultural jobs require an understanding of science	236	3.49	1.09	169	3.44	1.12
Agriculture is more than farming	234	3.48	1.38	168	3.78	1.30
Research in science has improved agriculture	236	3.46	1.26	169	3.48	1.89
Agricultural jobs require much education	240	3.27	1.31	171	3.14	1.38
Composite score	222	3.46	.65	160	3.43	.74

Scale: 1 = Never, 2= Rarely, 3= Sometimes, 4= Usually 5 = Always

Research Question Three

Do perceptions of science learning and agriculture differ among students participating in the agriculturally-based curriculum program and those not participating?

In 1992, the perceptions of science learning and agriculture was significantly stronger among treatment group students than control group students. Similarly, in 1995 the treatment group perceptions remained stronger, although a slight strengthening occurred in the control group (Table 5). The t value indicates the differences in mean scores between treatment and control groups.

Table 5. Science Perceptions Composite Score Comparison

	Treatment			Control			
YEAR	n	M	SD	n	M	SD	t value
1992	196	3.46	.73	161	3.16	.75	3.80*
1995	228	3.45	.72	163	3.28	.83	2.12*

Scale: 1 = Never, 2= Rarely, 3= Sometimes, 4= Usually, 5 = Always
*significantly different at $p<.05$

Table 6 indicates that over the three year period, the mean perceptions about agriculture increased among treatment group students, while it declined among control group students. The change in perceptions, however, was not significantly different.

Table 6. Agriculture Perceptions Composite Score Comparison

	Treatment			Control			
YEAR	n	M	SD	n	M	SD	t value
1992	196	3.38	.62	154	3.47	.66	1.30
1995	222	3.46	.65	160	3.43	.74	.30

Scale: 1 = Never, 2= Rarely, 3= Sometimes, 4= Usually, 5 = Always

Research Question Four

What was student agri-science knowledge level in both the treatment and the control group and how did it change over time?

An agri-science knowledge test was designed to assess student knowledge level about agriculture as a science. As indicated earlier, the agri-science knowledge test consisted of twenty seven true-false questions. The test was administered to fifth grade students in both control and treatment schools at pre-and post-project periods. In 1992, the pretest scores ranged from 10 to 25 for the treatment group, while the control group scores ranged from 7 to 24. Three years later, scores ranged from 7 to 23 for the treatment group and from 10 to 24 for the control group. Mean test scores are presented in Table 7. Findings show that agri-science literacy level of students did not differ significantly between treatment and control schools and it did not change significantly over the three year period.

Table 7. Agri-Science Knowledge

	Treatment			Control			
YEAR	**n**	**M***	**SD**	**n**	**M***	**SD**	**t test**
1992 Test score	212	18.69	2.93	169	18.71	2.96	.05
1995 Test score	239	18.13	2.78	173	18.67	2.98	1.87

*based on a 27 question True-False agri-science knowledge test

CONCLUSIONS / RECOMMENDATIONS / IMPLICATIONS

This study found that fifth grade students in Michigan's rural "thumb" region hold positive perceptions about science. They believe that learning science is fun and that science is one of their favorite subjects. Similarly, they believe that agriculture is more than farming and is part of science. After exposure to an agriculturally-based curriculum in science for three years, treatment group student perceptions about science learning as well as about agriculture did not change significantly. Further, the level of agri-science knowledge among fifth grade students remained the same. Similarly, the control group's perceptions of science learning and of agriculture did not change significantly over the three year period, nor did their agri-science knowledge. To put it simply, introducing agriculturally-based curriculum, in this case, did not alter or negatively effect student perceptions of science, agriculture or their agri-science knowledge level.

A limitation of this study is that no attempt was made to distinguish between the level of adoption of the agriculturally-based science curriculum by treatment school district teachers. Further research be could conducted to ascertain the relationship between level of adoption and teacher perceptions about agriculture and teaching science through an agricultural context. Additional studies should be undertaken to determine the effect of agriculturally based curriculum on student performance on standardized science tests. Such a study could yield more conclusive data on the impact of such an educational innovation.

An implication of this study is that agricultural educators must be cautious when extolling the virtues of teacher inservice programs in agricultural literacy. In this case, even though there were administrative support, abundant human and fiscal resources, a well planned curricula, and time devoted to professional development, interventions with teachers did not effect student performance on tests of agricultural or scientific knowledge. In other words, time spent with teachers may not necessarily equate to increased literacy among students. Further, Trexler and Suvedi (1996) reported in a related study that teachers, after three years of the interventions outline in this paper, possessed more favorable agricultural and scientific perceptions than prior to treatment. However, as reported in this paper, these more favorable teachers perceptions were not transferred to the teachers' students studying the agri-science curricula.

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Effects of an Elementary Agri-Science Program on Student Perceptions of and Performance in Agriculture and Science

A Critique

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The problem statement is well stated and supported by the literature review. The use of teacher-driven curriculum development process is an important step in this type of curriculum change. The authors are also to be commended for the use of inservice programs and developing kits of materials for teacher use so everything was provided. The design of the study was appropriate but the reliability of the instrument of 0.60 and 0.77 could have been a problem. It is low and may not show differences between groups when in fact they do exist. Because this reliability score was the result of the field test there was an opportunity to revise the instrument to improve the reliability. This can be done by increasing the number of items used or restating the items.

The results were reported adequately in tables and text and presented following each of the research questions. The conclusions drawn were based on the results.

The time and effort in developing such materials and conducting such a study requires that we also develop the best instrument possible to determine the value of such an effort. My question is can we be satisfied with an instrument having a reliability of 0.60 and 0.77.

The Cheeseburger Came From Where?: Elementary Students Understanding Of How Food Is Affected By Biology And Climate

Cary Trexler
Michigan State University

INTRODUCTION

The past decade brought an increased awareness of and concern for environmental issues. Industrial agriculture production practices have come under increasing scrutiny by select agricultural producers and researchers (Schwarzweller and Lyons, 1995). Sustainable agricultural practices that focus on regenerating our natural resources such as soil or water while maintaining or improving farm productivity are increasingly being adopted by farmers. Wilkins (1995) described these production-based moves as being at the micro-level. Increasingly, there is an awareness that for sustainable practices to take hold at macro-level, consumers--who drive production practices through their consumption of food and fiber products-- must possess a basic understanding of their role in the human agri-food system (Berry, 1977; Wilkins, 1995). Consumers, however, are "unconscious" of how their eating habits affect the way the planet's natural resources are used (Berry, 1990). They perceive no problems with their food supply, since grocery stores are overflowing with an array of foods. Many see only the food and are unaware of the social, technological, and scientific trade-offs that the current system requires; the agri-food system is a "black box" to most Americans.

THEORETICAL FRAMEWORK

Latour (1987) asserted that black boxes emerge when networks of technology users accept the benefits of a technology with deference to its construction. These black boxes are no longer questioned, but accepted as part and parcel of life. Rouse (1987) cautioned that society needs to critically question the use of scientific knowledge and technologies in order to determine what it values. To do this, people need to possess an understanding of scientific and technological principles in order to assess their implications for the environment and culture; without this understanding, people are unlikely to move beyond consideration of their own immediate self-interest (AAAS, 1989).

Acquiring such understanding is a cumulative process that begins when people are very young. If consumers are to move beyond their current myopia of the agri-food system, U.S. public school the curricula must integrate human food system concepts and examples into other subjects. The National Research Council (1988) coined the term agricultural literacy and suggested that the science of agriculture was too important to be taught to only those in vocational education. Agricultural educators advocate the integration of agricultural concepts into school science curricula (Leising and Zilbert, 1994; Birkenholz et al., 1994; Frick, Birkenholz, and Machtmes, 1995). In science education, the American Association for the Advancement of Science Project 2061 (1989) identified agriculture as one of the eight basic technology areas for study by our nation's students. The association argued that the boundaries between traditional subjects should be softened and more emphasis placed on the connections among science, technology, and society" (AAAS, 1989, p.5).

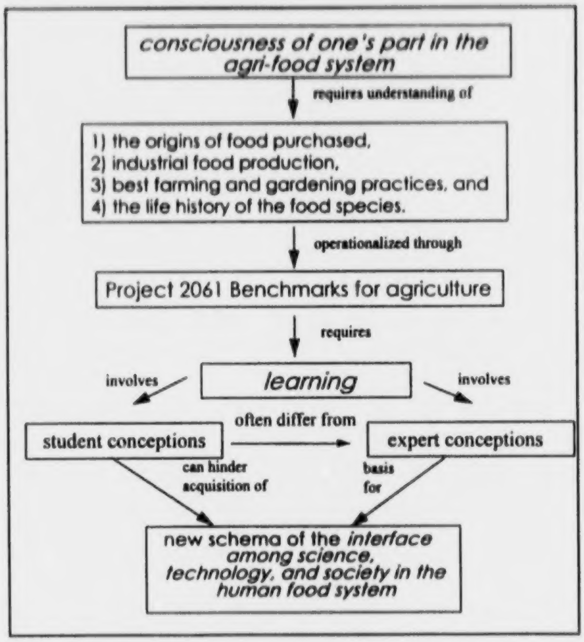
Practitioners sought guides for the implementation of agricultural examples in science curricula. In 1993, AAAS released Benchmarks for Science Literacy which, among other things, defined content necessary to understand the human food system.

Over the past two decades, studies in science education compared student conceptions to those of experts (Smith, 1990; Driver, Guesne, and Tiberghien, 1985; Novack, 1983). These studies, based on Piaget's work in cognitive psychology, tend to follow the theory that learning occurs through the active construction of a mental schema---a psychological representation of cognitive relationships of knowledge and ideas. The purpose of much of this research was to bring to the fore the unique understanding and meaningfulness to the individual. This is particularly important since students have strongly held well-integrated beliefs that can actually interfere with bringing their personal understandings into accord with those of experts (Anderson and Smith, 1986; Posner, Strike, and Gertzog, 1982). By ferreting out incompatible understandings, educators can structure teaching to challenge a learner's naive conceptions.

Problems arise in regard to learning about the agri-food system; researchers know little about what individuals understand about this complex system. Hence, educational programs and curricula may focus on areas where students already possess well developed and scientifically accurate schema, while ignoring other areas where incompatible or naive understandings persist. Decisions about complex societal and environmental issues, such as trade-offs within our industrial agri-food system, require an understanding of complex interrelationships, not simply knowledge.

Currently there exists a growing body of knowledge on the agricultural literacy of students, prospective teachers and adults (Frick, Birkenholz, and Machtmes, 1995; Birkenholz et al., 1994; Flood and Elliot, 1993). In agricultural education, abundant knowledge and positive perceptions gleaned through survey research are often equated with literacy. Frick and Wilson (1996) suggest, however, that agricultural literacy involves, not simply a cache of facts, but a basic *understanding* of agriculture, the agricultural industry, and its importance to our country and citizens" (p. 59). To "understand" is a personal affair, one entailing a struggle to grasp meaning (Dewey, 1933), and one not readily measured through survey methods. Presently, neither science nor agricultural education understands what people understand about the agri-food system

CONCEPTUAL FRAMEWORK


consciousness of one's part in the agri-food system
requires understanding of
1) the origins of food purchased,
2) industrial food production,
3) best farming and gardening practices, and
4) the life history of the food species.
operationalized through
Project 2061 Benchmarks for agriculture
requires
learning
involves
involves
student conceptions
often differ from
expert conceptions
can hinder acquisition of
basis for
new schema of the interface among science, technology, and society in the human food system

This qualitative study's interdisciplinary conceptual framework moves from developing consciousness of the food system to the development of new schema of how science, technology and society interface in this complex system (Figure 1). The framework considers what is necessary for individuals to become conscious of their role in the agri-food system. Berry (1990) suggests "eaters...must understand that eating takes place inescapably in the world, that it is inescapably an agricultural act, and that how we eat determines, to a considerable extent, how the world is used" (p. 149). To promote understanding, Berry argues that eaters must learn about: 1) the origins of food purchased, 2) industrial food production, 3) best farming and gardening practices, and 4) the life history of the food species. To

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operationalize Berry's ideas, the researcher selected AAAS's (1993) Benchmarks for Science Literacy's subsection on agriculture (Table 1) ---this anchored the agri-food system in a subject that is taught in all schools, science. Two of the nine agricultural benchmarks found in kindergarten through fifth grade were selected for analysis; they are foundational to an elementary understanding of biology, food distribution, and climate pertaining to the agri-food system

Table 1. Selected benchmarks from *The Designed World, agriculture*

Macro concept: Sustainability of the human food system

Kindergarten through grade 2

By the end of second grade, students should know that:

- Most food comes from farms either directly as crops or as the animals that eat the crops. To grow well, plants need enough warmth, light, and water. Crops also must be protected from weeds and pests that harm them.

Grades 3 through 5

By the end of 5th grade, students should know that:

- Places too cold or dry to grow certain crops can obtain food from places with more suitable climates. Much of the food eaten by Americans comes from other parts of the country and other places in the world.

Science education's conceptual change theory, based upon cognitive psychology, drives the remainder of the study. The researcher analyzed student understandings of the benchmarks and compared these to expert understandings. From these comparisons, areas where informants held incompatible and compatible understandings with experts were ascertained.

PURPOSES / OBJECTIVES

The purpose of this exploratory qualitative study was to determine elementary student understandings of two concepts foundational to an understanding of a sustainable human food system. The following questions directed the study:

1) What are the interviewees' demographic backgrounds?
2) How do student biological understandings of the agri-food system compare to the Project 2061's Benchmarks for Science Literacy?
3) How do student understandings of food distribution and climate compare to Project 2061's Benchmarks for Science Literacy for the agri-food system?

METHODS / PROCEDURES

Population

Four students were purposefully selected for interview from an ethnically and soci-economically diverse neighborhood in urban Lansing, Michigan. Informants were selected based upon, grade level, type of school attended, gender, and ethnicity. The interviews were conducted one month prior to the end of the school year. Two of the participants were in sixth grade, while the other two were in fifth and fourth grade respectively. The sixth grade students attended the same middle school, the fifth grader a Catholic school, and the fourth grade student a Public Charter School.

Data Collection

Clinical interviews elicited informant understandings of the agri-food system and identified cognitive structures and the states of cognitive development (Novack and Gowin, 1984; Posner and Gertzog, 1982). The interview is widely accepted as a research tool to externalize conceptual or structural knowledge (Jonassen, Beissner, and Yacci, 1993). Each interview took roughly 45 minutes. Approximately five minutes were spent determining demographic background; the remainder probed student understanding of benchmarks. Interviews were videotaped and transcribed, serving as the primary data sources. Field notes and products created by the interviewees were consulted as secondary data.

Interview questions and protocol

Questions and protocol were reviewed by members of Michigan State University's (MSU) Department's of Educational Psychology and Agricultural and Extension Education. The interview began with questions about the background of each student. To ground the conversation in a familiar context, interviewees were provided a cheeseburger from a nationally known fast food chain. The researcher hoped that by starting with this common basis students could easily express their ideas about the steps this familiar food goes through on its way from production to consumption.

Interviewees were asked to separate the cheeseburger into its component parts so that the complex food could be more easily analyzed. The researcher then asked the participants to explain how the cheeseburger's "parts" arrived at the fast food restaurant. Questions required interviewees to trace back only the lettuce and meat to their origin; these two foods were selected since they are the least processed of the cheeseburger's components. Further questions probed participant understandings of the two benchmarks: 1) the biological origins of the food and growth requirements and 2) limitations of geography and climate on food production.

Analysis of Data

In this study, demographic information was reported descriptively. Biological and climatic understandings related to the agri-food system were analyzed using Hogan's (1997) scheme for representing highly complex student thinking about ecosystems. Analysis of this data involved four phases.

First, expert propositions for the Project 2061 Benchmarks for agri-food system and related subconcepts were generated by the researcher and were validated by MSU's Science Education and Agricultural and Extension Education faculty. These were based on the understandings expected of a student at the completion of his/her fifth grade year.

In the second phase, raw data from student interview tapes were analyzed by generating conceptual proposition maps, these served as summary portrayals of student thinking for each benchmark (West, Fenham, and Garrard, 1985). To assure accuracy of these maps, the researcher initially viewed each videotape to translate student thinking into a concept map. After several days, maps were verified for accuracy by comparing them repeatedly to tapes of the informant's interviews.

Phase three focused on coding student responses. The sophistication of student thinking about a given topic, as represented in the conceptual proposition map, was judged for each subconcept along two dimensions: quality (compatibility) and depth (elaboration of response) by comparison with expert propositions. Student understandings were assigned codes based upon this comparison scheme (Table 2).

The final phase of analysis sought confirming and disconfirming evidence of patterns among individuals (Miles and Huberman, 1994), this was accomplished by two procedures. First, each subconcept was analyzed across individuals. And second, holistic portraits of student thinking were analyzed to ascertain how understanding or misunderstanding of subconcepts might influence understanding of another subconcept, and ultimately the understanding of the agri-food system, with emphasis on sustainability.

FINDINGS / DISCUSSION

Question 1: Demographic background and thoughts about food

Subjects came from various ethnic and racial backgrounds as well as different genders (Table 3). Three of the four students had parents who were either separated or divorced. All lived in a racially and socio-economically diverse urban neighborhood in Lansing, Michigan. Three of the four subjects had only lived in Lansing, while one interviewee had lived in urban, suburban and rural areas. All subjects were in grades four through six, although they were not all in traditional public schools.

Table 2. Coding Scheme to Compare Student Propositional Maps with Experts

Code	Description
CE (Compatible Elaborate)	Statement concurs with the experts proposition and have sufficient detail to show the thinking behind the concepts articulated.
CS (Compatible Sketchy)	Statement concurs with expert proposition, but essential details are missing. Bits and pieces of facts are articulated but are not synthesized into a coherent whole.
CI (Compatible/Incompatible)	Sketchy statements are made that concur with the proposition, but are not elaborated upon. At other times, statements contradict proposition.
IS (Incompatible Sketchy)	Statements disagree with the proposition, but provide few details, and are not reoccurring. Responses appear to be simply guesses.
IE (Incompatible Elaborate)	Statements disagree with proposition and students provide details or coherent, personal logic supporting them. Same or similar statements/explanations recur throughout the conversation.
N (Nonexistent)	Students respond "I don't know" or do not mention the topic when asked a question calling for its use.
ø (No evidence)	A topic was not directly addressed by a question and students did not mention it within the context of response to any question.

Summary / Discussion of demographic background and thoughts of food

The subjects, except for Tony, all lived in an urban area for their entire lives. Tony, on the other hand, had lived in rural areas where he was exposed to the growing of food on a large scale. Only Tony expressed curiosity about the origins of his food. On a personal level, he seemed to be struggling with the notion of unsanitary living things providing him with food. For Grant, Art and Erika, those growing up in an urban area, Berry's (1990) idea seems to hold true "food is pretty much an abstract idea--something they do not know or imagine--until it appears on the grocery shelf or on the table" (p. 146).

Table 3. Demographic information

Informants

Grant, 4th grader

! African American, lower middle class
! grew up in Lansing, urban area
! attends Public Charter School Academy, previously an urban public elementary school
! guardian's employment - mother state government; father cook and janitor

Erika, 5th grader

! Northern European American, lower middle class
! grew up in Lansing, urban area
! attends catholic school
! guardian's employment - father state government; mother does not work out of home

Art, 6th grader

! African American, lower middle class
! grew up in Lansing, urban area
! attends public middle school, previously an urban public elementary school
! guardian's employment - mother state government; father cook and janitor

Tony, 6th grader

! Northern European American, lower middle class
! grew up in rural ID, MT, OR on two acres
! attends public middle school
! guardian's employment - father science teacher; stepmother works in home

Question 2: Biological understandings of the human food system

Table 4. Summary codes for biological understandings

Concepts	Grant	Erika	Art	Tony
Kindergarten -Grade 2 Benchmarks				
Farms				
A. Most food comes from farms	CE	CE	CE	CE
B. Protection of crops	IE	IS	IS	CS
Plants and Animals				
C. Food comes from animal and plants	CE	CE	CE	CE
D. Plant growth needs	IE	IE	IE	IE
E. Animal growth needs	CE	IS	CE	CE

ø--No evidence; N--Nonexistent; IE--Incompatible Elaborate; IS--Incompatible Sketch; CI--Compatible/Incompatible; CS--Compatible Sketchy; CE--Compatible Elaborate

Subconcept A: Farms

One type of understanding predominated this subconcept: *Compatible Elaborate* (Table 4). All subjects understood that food was grown by farmers on farms. Upon further probing, however, they all stated lettuce grew in relatively small fields (1/2 to 4 football fields in size). Grant, Erika and Art believed that these fields also contained other vegetable crops such as carrots, tomatoes growing in rows next to the lettuce. In contrast, Tony stated that lettuce grew by itself in fields with rows for sprinklers.

Subconcept B. Protection of crops

Three types of understandings were found in this subconcept: *Incompatible Elaborate, Incompatible Sketchy and Compatible Sketchy* (Table 4). Grant's *Incompatible Elaborate* understanding was based on his idea that plants were placed into greenhouses to protect them from dust. This idea was robust surfacing several times throughout the interview. Erika's *Incompatible Sketchy* understanding was based on the need to protect lettuce from animals by fencing it in, while Art stated that the lettuce needed to be protected from wind and cold. Tony's *Compatible Sketchy* understanding was based on the idea that plants needed to be protected from bugs by the use of bug killers.

When probed about protecting the animals that produced the meat, Erika could think of nothing that the "pigs" (the source of the hamburger meat) needed to be protected from, while Grant stated that "pigs" needed to be given shots by farmers so "they don't get sick from the mud." He went on to say that the pigs did not need to be protected from the cold because their fat kept them warm. Grant also mentioned that the farmer needed to protect the pigs from theft. Art followed this line of thinking by adding that the cows which made the meat needed to be protected from people with guns and from kids running them into fences. He also added that cows needed to be separated from bulls for their protection. Tony stressed that the cows needed to be protected from getting too cold and said that the farmer did this by moving them into a shed.

Subconcept C: Food comes from plants and animals

In this subconcept, all students possessed a *Compatible Elaborate* understanding (Table 4). All indicated that lettuce was a plant that grew in dirt. Grant stated that lettuce grew on trees, while Tony described lettuce as being the whole plant, in contrast to pickles (cucumbers) which are just a part of a plant. Regarding the hamburger, as stated previously, all subjects stated that the hamburger came from an animal, Grant and Erika said from pigs, Art and Tony from cows. They all mentioned that animals were killed in order to produce meat for humans; they did not talk about the killing of lettuce by humans for food.

Subconcept D: Plant growth needs

Only *Incompatible Elaborate* responses were found in this subconcept (Table 4). Grant, the youngest of the subjects had the most incompatible response in this area. He stated that lettuce needed fiber, water and lettuce food (seeds) to grow. Erika, Art and Tony answered this question quickly and in authoritative fashion, "water, sun and soil." Art indicated that soil was the food for the plant. He also spoke at length about farmers having to give plants "little white pellets or sticks of plant food" to help them grow.

Subjects varied in their idea of the length of time needed for lettuce to grow to a size that was found on their cheeseburger. Grant said that the lettuce took three weeks to grow; Erika said about one year; Art -two weeks to a month; and Tony -two to three months.

Subconcept E: Animal growth needs

Table 4 indicates that there were two types of understandings in this subconcept: *Incompatible Sketchy* and *Compatible Elaborate*. The *Incompatible Sketchy* respondent, Erika, stated that "pigs" needed to be given milk to grow. When prompted for elaboration on why pigs needed milk, she said she didn't know why." *Compatible Elaborate* responses included water and food (Art said grass). In addition, Tony included a place to roam. Along this same line, Art suggested the farmer raising the animals for the hamburger needed about two hundred acres for them to live. Grant stated that the "pigs" for the meat needed a farm about the size of one football field for 150 pigs.

Summary / Discussion of biological understandings of the agri-food system

Farms

Students understood that food is grown by people called farmers on farms, however those with limited exposure to farms had naive conceptions about what farms actually are. They seemed to think that foods, lettuce in this case, were grown in large gardens much like those they may have seen through their own experience near their homes. These conceptions do not match the reality of today's large scale industrial farms.

Relative to crop protection, students had limited understanding regarding from what lettuce needs to be protected. By the shallowness of their response, it appeared that this is an idea that they had given very little thought to in the past. Regarding the meat (animals), many of their responses were based upon their own personal experiences, rather than what actually might happen to animals on a farm. Only one student stated that plants needed to be protected from insects that plague farmers and their crops. No student mentioned weeds as a threat to crop production.

Plants and Animals

Although there was not consistency on which parts of the plant lettuce came from or which animal was killed for meat, all four subjects understood that plants and animals were the sources of their food. By their responses, students seemed to emphasize that the animal was killed for humans to eat, while the same concern was not expressed for the lettuce.

Regarding plant growth needs, the fifth and sixth grade students were quite familiar with this canonical scientific knowledge and parroted back the basic needs of plants--water, soil, sun; students seemed to have memorized these from the formal school curriculum. However, it is interesting to note that no subject cited warmth as a plant growth need.

Except for one student, interviewees understood the growth needs of animals. The three stated that water and food were needed for growth. The two sixth grade students also understood that animals needed adequate space and appropriate temperature.

Question 3: Food distribution and climates

Table 5. Summary codes for food distribution and climate

Concepts	Grant	Erika	Art	Tony
Grades 3 through 5				
Food distribution and climates				
A. Climate limits crop growth	CS	CE	IS	CE
B. Food comes from more suitable climates	CS	CS	IS	CE

ø--No evidence; N--Nonexistent; IE--Incompatible Elaborate; IS--Incompatible Sketch; CI--Compatible/Incompatible; CS--Compatible Sketchy; CE--Compatible Elaborate

Subconcept A: Climates limits crop growth

Grant articulated a *Compatible Sketchy* understanding; Art was inaccurate thus the *Incompatible Sketchy* coding, while Erika and Tony possessed *Compatible Elaborate* understandings (Table 5). All informants upon initial probing believed that the lettuce came from Michigan. However, interviews occurred in early spring, before the temperatures were above freezing. It appeared three of the four informants had not considered the origin of lettuce before; by probing their ideas, however, they could be led to evaluate growing conditions suitable for lettuce.

Art- **Talking about where the lettuce came from on the cheeseburger.**

I: OK, now the lettuce and the pickles, where do you think they were grown?

A: ...Probably grown, here.

I: OK, and what do you know about plants ? What do they need to grow?

A: They need water and sunlight.

I: OK, anything else?

A: And food.

I: And food.

A: From the dirt.

I: From the dirt. OK, does it matter how warm or cold it is?

A: (Nods) Has to be warm.

I: So, what was the temperature like here in Michigan last month?

A: Cold.

I: So, go ahead.

A: About in the...fifties.

I: OK, how do you think lettuce would grow in the fifties?

A: Not very good.

I: So, you still think it was grown here in Michigan?

A: (Shakes head) No.

I: Where do you think it was grown then?

A: Probably out in Detroit.

Tony- Talking about where the lettuce came from on the cheeseburger.

I: Now, where did this [lettuce] come from?
T: (Shakes head) Maybe...where did it come from?
I: You said it came from a field. Where's the field?
T: Out in the country.
I: OK, in Michigan?
T: In Michigan, ... all, well most of the...Idaho...all of the Oregon, Montana, Washing...all of those states that do grow stuff.
I: OK, so if it was growing in Michigan, right now, how long do you think it takes that plant to grow, lettuce?
T: Probably about two or three months.
I: OK, so that means that it was planted, then, in December.
T: (Nods) OK.
I: OK, so you think that somebody planted the lettuce in December, in Michigan?
T: I wouldn't think that. They would if it was in a greenhouse; they could.
I: So, why couldn't it be outside in Michigan.
T: It's too cold; they would die.
I: OK, so where do you think it came from, you just said it was too cold.
T: Probably a warm state like Florida.

Subconcept B: Food comes from more suitable climates

There are three types of understandings of this subconcept *Incompatible Sketchy, Compatible Sketchy* and *Compatible Elaborate* (Table 5). The *Compatible Sketchy* response was proffered by Grant after his thinking was challenged. He stated that the lettuce was probably grown in a cabbage patch somewhere like Texas or Idaho because these states have cold air and warm air. Art's understanding was *Incompatible Sketchy* as he stated that the lettuce was grown in Michigan. Under direct probing about whether lettuce could have grown a month before, and considering his idea about days to harvest, he guessed that the lettuce was probably grown in Detroit. He did not see the connection between the cold climate and growth, or he was unfamiliar with climates and geography in other areas. *Compatible Elaborate* understandings were held by Erika and Tony, since, after direct probing about their ideas regarding days to harvest, each deduced that the lettuce had to grow in a warmer climate. Tony also suggested that lettuce could be grown in Michigan if it were in a greenhouse during the winter.

Summary / Discussion

The understandings regarding food distribution and climates are intriguing. All subjects initially believed that lettuce was grown during winter and early spring in a cold climate; they, it seemed, had not ever considered from where the lettuce (or other fresh fruits and vegetables) came. When reviewing the *Incompatible Elaborate* understandings of the plant growth requirements, it was apparent that the lack of understanding about warmth as a requirement for plant growth contributed to this misconception. However, three of the four quickly, and with little challenge, gave up their misconception about where lettuce is grown when it is cold outside.

CONCLUSIONS / RECOMMENDATIONS / IMPLICATIONS

At this embryonic stage of theorizing about what is necessary to be conscious of one's part in the "agri-food system," Merriam and Simpson (1989) presented a strong case for the use of qualitative methods. These methods, they suggest, "lead to an increased understanding of the phenomenon by clarifying concepts, generating hypotheses or constructing explanatory frameworks. The methodologies are, in fact, particularly appropriate to use where there is little knowledge about the problem" (p. 90). Hence, conclusions, recommendations and implications from this study are not meant to be abstract universals built by generalizing from a sample to a population. Rather, the goal is to understand student understandings through description of concrete universals (Erickson, 1986). Concrete universals are arrived at by studying a specific case in detail and then comparing it to others studied in equally great detail---a method appropriate to studying the schema of individuals.

CONCLUSIONS

1. Informants who had lived only in an urban environment either did not consider the food they ate, or only thought about it on a purely appetitative level. The informant who had lived in closest proximity to were food grew was more conscious of and wondered about the living things that became his food.
2. School-based science understandings of subconcepts for the agri-food system run the gamut from well-developed in the case of plants and animals being the source of food, to partial for foods coming from distant places, to non-existent for protection of crops from certain pests.
3. Canonical science knowledge learned or not learned within the confines of the discipline helps or inhibits understandings of the agri-food system's complexity. specifically, student non-conception about the need for warmth for plant growth limits understandings about the need to grow fresh fruits and vegetables in warm climates.
4. Understandings of food production are complex, involving interrelated biological and climatic ideas that are challenging for students to integrate into their personal schema.

RECOMMENDATIONS

1. Biological and climatic understandings necessary to comprehend a sustainable food system could be fostered by curricula based on the Benchmarks for Science Literacy. Learning about the origins of food and the environmental and cultural trade-offs of the industrial food production may spark interest and debate in social studies and science.
2. Educational experiences should occur in formal school settings to help students understand the current structure of farms and how plants and animals are raised for food.
3. Further research could shed more light on the following questions: a) Do students understand how industrial farms grow food? b) Which scientific cannons are missing from the curricula that limit student conceptions of the agri-food system? and c) What educational programs can counter robust "misconceptions" about the agri-food system?

IMPLICATIONS

1. Areas neglected in science education, limit student understanding of the interrelationships between humans and other plants and animals. Students do not understand that plants and animals (weeds and insects, for example) compete for food with humans, they are unable to weigh the biological trade-offs in the production of food.
2. Qualitative studies that bring to the fore understandings of individual can assist educators, curriculum developers, and researchers design strategies to help learners develop new schema of how science, technology and society interface in the agri-food system

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The Cheeseburger Came from Where? Elementary School Students Understanding of How Food is Affected by Biology and Climate

A Critique

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The author begins this paper with a good review of the literature identifying the fact that most consumers are unaware of how their eating habits affect the planet. Using interviews the author evaluated four students on the basis of two of the four areas identified in "Project 2061 Benchmarks for Agriculture." The four students were selected because "...they are representative of other students in urban Lansing." I would question how representative they are and ask that the author elaborate on this point.

The idea for the interviews was great. The interviewees were given an item which they often see and asked to analyze it. Because the interviews were limited to 45 minutes. I would ask why a greater number of interviews were not given. Ten to fifteen interviews would have made it much more representative but still do no represent the Lansing urban students.

If, however, the author were interested in only four students why not collect additional information. Only two of the four areas suggested by Berry (1990) that consumers must have a knowledge of were included. No justification was given for this limitation.

I believe the author has a great idea for this qualitative study and by increasing the scope of the study it would be enhanced greatly.

The Effects Of An Agricultural Literacy Treatment On Participating K-12 Teachers And Their Curricula

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Introduction

As we approach the dawn of the 21st century, it is important to consider the status of our nation's agricultural knowledge. The United States has always relied on it's own agriculture to produce one of the most abundant, least expensive food supplies in the world (Birkenholz & Stewart, 1991). American farmers have become increasingly more efficient in food production practices. As a result, fewer and fewer members of our society have been involved in the production of our food and fiber (Birkenholz, Harris & Pry, 1994). Less than 2% of the population raise crops that feed and clothe the people of the United States and many foreign countries. Due to the success of the American farmer, most citizens are not required to work in production farming (Birkenholz, 1990). As a result, the general public is becoming increasingly unaware of the source and methods used in the production of their food (National Research Council, 1988; Raven, 1994). This problem can be identified as a lack of "agricultural literacy" (Russell, McCracken, & Miller, 1990; Frick, Kahler, & Miller, 1992).

As defined in the National Research Council's report Understanding Agriculture: New Directions for Education (1988), an agriculturally literate person should understand the food and fiber system, which would include its history and its current economic, social, and environmental significance to all Americans. Furthermore, Frick et. al (1992) adds:

> Agriculture literacy is understanding and possessing knowledge of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture. Basic agricultural knowledge includes: production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment, the marketing and processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products (p. 41).

Although a decreasing number of Americans are directly involved in the production of food, more and more are concerned about what they perceive as unnecessary and inappropriate methods of satisfactory food production (National Agriculture Research and Extension Users Advisory Board, 1991). As general concerns rise over the way our food is produced, public impressions are tainted by the actions of special interest groups (Lichte & Birkenholz, 1993).

As a result, many Americans elect and influence lawmakers to directly intervene into the practices used in producing our food and fiber (Hamlin, 1962). Because this nation has progressed to two full generations removed from living and working on farms, lawmakers cannot be expected to make informed decisions regarding the safe and appropriate production of our food supply (Flood & Elliot, 1994; Deavers, 1987; North Carolina State University, 1988; Nipp, 1988).

One factor influencing the decline in agricultural literacy in our nation today is the lack of educational emphasis placed upon this vital component of our society. The National Research Council (1988) stated: "Agriculture is too important a topic to be taught only to the relatively small percentage of students considering careers in agriculture and pursuing vocational agriculture studies" (p. 1). In 1988, The National Research Council recommended that: "Beginning in kindergarten and continuing through twelfth grade, all students should receive some systematic instruction about agriculture" (p. 2). This instruction could be integrated into the existing coursework required during compulsory education.

Birkenholz et. al (1993) concluded that teachers in elementary and secondary schools should be encouraged to develop a greater understanding of the importance and significance of agriculture in this country and the world. "Instructional assistance should be provided through pre-service and inservice programs which would facilitate the use of agricultural examples in elementary and secondary school classes" (p. 57). Furthermore, secondary teachers in history, social science, science, mathematics, language arts, and fine arts teach subjects that could provide a context for infusing instruction about agriculture (Law, 1990).
In addition, in an editorial appearing in The Chronicle of Higher Education, Mawby (1984) described the role of land grant colleges and universities in educating non-farm people about agriculture:

> A variety of institutions can play a role in shaping the direction of American agriculture, but none is more qualified than the land grant colleges of agriculture, with their unique tradition of research, teaching, and extension. Taken collectively, these institutions can educate or influence both the people and the processes affecting the future of agriculture. (p. 72)

With this uniquely important qualification, it seems imperative that program directors' in colleges of agriculture utilize their positions of influence to modify the current practices of educating the people about the future of agriculture. Through implementation of programs specifically designed to improve both the knowledge and attitudes non-agricultural teachers have concerning agriculture, land grant institutions can have a state-wide impact on populations typically not reached by traditional university efforts.

In response to the charge of providing a foundation of agricultural knowledge to teachers with no agricultural background, the Department of Agriculture Education and General Agriculture at Oregon State University joined forces with the Oregon Farm Bureau to develop and deliver an agricultural literacy program to assist teachers in integrating agriculture into their curriculum. The Summer Agriculture Institute (SAI) was established in 1988 to assist teachers in acquiring knowledge of agriculture and to aid teachers in developing lessons that integrate agriculture into their curriculum. This week long intensive training gave non-agricultural K-12 teachers an overview of agriculture and its impact on society. Teachers received 60 hours of training and were required to complete a lesson plan which integrated agriculture into a lesson they currently taught.

Purpose

The purpose of this study was to determine if the participants in the Summer Agriculture Institute used agricultural information obtained at (SAI) in their curricula. The following research questions were addressed:

1. What were the demographic characteristics of the SAI participants?
2. Did K-12 teachers who participated in the agricultural literacy program use the agricultural information in their curricula?
3. What were teacher perceptions of content, structure, and usability of the agricultural literacy program presentations and materials?

4. What were teacher perceptions of student interest in implementing specific agricultural topics into the curriculum?
5. What barriers existed that prevented teachers from integrating agriculture into their curricula?

Procedures

The population used for this study included all K-12 educators who participated in the Oregon Farm Bureau/OSU Summer Agriculture Institute held at Oregon State University from 1988-1996. The accessible population was limited to K-12 teachers whose names were provided by the Oregon Farm Bureau and consisted of all available records of the participants who were still teaching. The list of names and addresses was cross-referenced with university records to determine if they maintained the same address and/or school since attending the agricultural literacy institute. For the individuals who had moved, the internet program *www.switchboard.com* was used to locate a useable mailing address. Individuals who had changed schools and moved were eliminated from the study.

A purposive sample of 81 participants who were teaching, and had obtainable addresses was identified from the population for inclusion in the study. Usable responses were received from 52 teachers for an overall response rate of 64.20 percent.

The data collection instrument was designed by Agricultural Education faculty at Oregon State University. The instrument was based upon the agricultural literacy concept areas identified by Frick et. al (1992), and the Institute objectives identified by Oregon State University and the Oregon Farm Bureau Federation. The instrument consisted of three sections including teacher perceptions of student interest in learning about agriculture, participants use of the agricultural literacy materials, and demographic information about the respondents.

The section regarding teacher perceptions included 36 statements for analysis based upon a 5 point Likert-type agree/disagree scale, with 5 representing strongly agree and 1 representing strongly disagree. The 36 statements were divided into six categories: a) sources of agricultural information, b) perceptions of student interest in learning about agriculture, c) barriers to implementing agriculture into existing lessons, d) implementing agriculture into the curriculum, e) summer agricultural literacy material, and f) the perceived need for teaching/learning about agriculture. The section involving use of SAI materials contained eleven statements requiring short answers, yes/no questions, and a selection of answers from a menu/list. Included in the instrument were 13 demographic questions.

Participants in the Summer Agriculture Institute ranged from pre-kindergarten teachers to advanced placement teachers in high schools, and had from three to thirty-five years of teaching experience. With this heterogeneous population, instrument reliability and validity were determined by a panel of experts, and a pilot test group. The instrument was further pilot tested by thirteen Summer Agriculture Institute participants from the 1996 institute, who were not included in the study.

The survey was mailed to the participants in the fall of 1996. A follow-up postcard was mailed to those individuals who had not responded in the first two weeks. Telephone calls were made to those individuals who did not respond to either of the previous contacts. Due to the time period covered by this research (8 years), no additional attempt was made to locate and contact the participants who had moved.

Findings

Demographic characteristics of the respondents are presented in Table 1 and 2. Over 55% of the respondents were elementary teachers, 21% were middle school/junior high school teachers and 17% were high school teachers. The level of education completed by the respondents varied from a Bachelor's degree to an educational specialist. Almost half of the respondents (44.2%) had earned a Bachelor's degree plus 30 credit hours, while 13.5% had earned a Master's degree. Over one-fourth of the respondents (26.9%) had earned a Master's degree with an additional 30 credit hours.

Table 1.
Descriptive Information of Respondents in Summer Agriculture Institute from Usable Surveys (n=52)

Descriptive item	Item descriptors	Frequency	Percent
Grade level	Elementary	30	57.7
	Middle School/Jr. High	11	21.2
	Secondary	9	17.3
	Adult	1	1.9
	Missing	1	1.9
Degree attained	Bachelor	2	3.8
	Bachelor + 15	1	1.9
	Masters	7	13.5
	Bachelor + 30	23	44.2
	Masters + 15	3	5.8
	Masters + 30	14	26.9
	Ed Specialist	1	1.9
	Missing	1	1.9
Gender	Female	32	61.5
	Male	19	36.5
	Missing	1	1.9
Relatives living on farm	Yes	27	51.9
	No	24	46.2
	Missing	1	1.9
Agriculture courses in High School or College	Yes	6	11.5
	No	46	88.5
4-H or FFA background	Yes	13	25.0
	No	39	75.0
Population of nearest town	under 1,000	6	11.5
	1,000-2,500	8	15.4
	2,501-10,000	14	26.9
	10,001-25,000	8	15.4
	25,001-100,000	7	13.5
	over 100,000	9	17.3

An analysis of the demographic data related to gender of the SAI participants revealed that 62% of the respondents were female and 37% of the respondents were male. Slightly more than half of the respondents (51.9%) indicated that they had relatives who lived on a farm, while 11.5% indicated taking an agricultural class either in high school or college. A total of 25% of the respondents indicated they were involved in 4-H or FFA while in high school.

Respondents were asked to identify the population of the town nearest their home. Choices were: a) under 1,000; b) 1,000-2,500; c) 2,501-10,000; d) 10,001-25,000; e) 25,001-100,000; f) over 100,000. Over one-fourth (26.9%) of the respondents reported that the population of the nearest town was between 2,501 and 10,000 with the remaining teachers evenly divided among towns of various sizes (Table 1).

The range of age of respondents was 24 to 64 with the mean age 46.67 (Table 2). The range of years of teaching experience for respondents was 3 to 35 years with the mean years of teaching experience being 18.92.

Table 2.
Selected Characteristics (n=52)

Descriptive Item	M	SD
Age	46.67	9.94
Years of Teaching Experience	18.92	7.55

The second objective was designed to determine if teachers who participated in the summer agricultural literacy program used the information gained in their curricula and, if so, to what extent was agricultural information integrated into existing lessons? Table 3 presents the frequency and percentages of daily lessons the respondents used each year.

Only five (9.6%) of the respondents indicated they had not used lessons that integrated agriculture into their curriculum.. Nearly 23 % of the respondents used agricultural information in 1-5 lessons each year, while 21 % of the respondents gave no definitive number of lessons used per year. Respondents in this category indicated difficulty in reporting data due to extensive thematic approaches for teaching students about food production, and that adopting agriculture as the framework for teaching all subjects made it impossible to accurately count the number of lessons used.

Table 3.
SAI Participants Integration of Agriculture Into Existing Course Work (n=52)

Number of Lessons/Year	Frequency	Percent
No lessons used	5	9.6
1-5	12	22.9
6-10	9	17.2
11-20	6	11.5
21-30	3	5.7
Greater than 30 lessons	7	13.3
No definitive number of lessons given	11	21.2

The third objective was designed to determine respondent's perceptions of the content, structure and usability of the materials and presentations offered at the Summer Agriculture Institute (SAI). The mean score for effectiveness of materials at SAI was 4.27.

When asked if the materials presented at SAI were appropriate for participant understanding, respondents agreed with a mean score of 4.42. A mean score of 4.33 represented teacher's perceptions that SAI provides a foundation in agricultural knowledge that is useful in implementing agricultural concepts into the curricula. Teachers agreed there is a need to attend SAI to update themselves about agriculture (Table 4).

Table 4.
Mean (M) and Standard Deviation (SD) for Teacher Perceptions of Content, Structure, and Usability of Agriculture Information for the Curricula (n=52)

Description	M	SD
Material at SAI was effective	4.27	0.69
Material at SAI was useful for implementing agriculture into my lessons	4.02	0.73
Material at SAI was appropriate for my grade level and subject level	3.85	0.92
Material at SAI was at the appropriate level for my understanding	4.42	0.60
There is a need for teachers to attend SAI to update themselves about agriculture	4.49	0.70
SAI provides a foundation in agricultural knowledge that is useful in implementing agricultural concepts into my curricula	4.33	0.71

Table 5 illustrates the fourth objective of the study that determined teacher perceptions of implementing specific agricultural topics into the curricula. The strongest responses were for instruction about animals with a mean score of 4.48. A mean score of 3.10 represented teacher perceptions concerning student interest in learning about agricultural economics.

The fifth objective was to determine barriers that prevent participants of the agricultural literacy program from integrating agriculture into their curricula. Table 6 presents the mean and standard deviation of eight barriers that respondents were asked to evaluate. The mean scores ranged from 1.84 to 3.71. Time to implement agriculture into the curricula received the highest mean score (M=3.71), and lack of follow-up from SAI coordinators received the lowest mean score in the category (M=1.84). This category contained items with the lowest mean scores.

Table 5.
Teacher's Perceptions of Student Interest in Learning About Specific Agricultural Topics (n=52)

Agricultural Topic	M	SD
Soils	3.51	0.98
Crops	3.91	0.66
Animals	4.48	0.61
Food Processing	3.65	1.02
Agricultural Mechanics/Technology	3.36	0.93
Agri-Business/Agricultural Economics	3.10	0.89
Agricultural Careers	3.58	0.87

The respondents had an opportunity to answer two open-ended questions. This allowed the researchers to gain insight into respondent's perceptions of SAI and to their motives for participating in an agricultural literacy program.

Table 6.
Mean (M) and Standard Deviation (SD) for Barriers to Implementing Agriculture Into Existing Lessons (n=52)

Barrier Description	M	SD
Time	3.71	1.19
Access to necessary supplies/materials/information	3.00	1.07
Lack of interest on teachers part	2.06	1.04
Lack of student interest	2.08	0.91
Lack of follow-up from SAI coordinators	1.84	0.75
Failure of previous lessons that implemented agriculture into my curricula	1.98	0.97
A change of teaching appointment	2.75	1.56
A change in the subject area taught since attending SAI	2.69	1.53

When asked to identify the element which created the most difficulty for integrating agricultural information into the curriculum, 18 different responses were generated. The most frequently stated factor was time. Fifteen respondents indicated that lack of preparation time created difficulty for getting agricultural information into the curriculum.

When asked to identify their purpose for participating in the SAI, the most frequently occurring response was the personal interest of the respondent. Fifteen different responses were given to this question. Gaining graduate credit and a desire to learn more about Oregon agriculture were tied for the second most frequently occurring response.

Conclusions

The following conclusions were based on the data collected from respondents participating in the Summer Agriculture Institute.

Participants in the Summer Agriculture Institute were experienced teachers. With an average teaching experience of 18.92 years and average age of 46.67 years, it could be concluded that participants in this agricultural literacy program were veteran teachers who were looking for ways to improve the quality and focus of their teaching.

Participants integrated agriculture into their existing lesson plans, with some utilizing the information gained in the agricultural literacy program to a high degree. Teacher perceptions of content, structure and usability of SAI presentations and materials was positive, with few exceptions. Participating teacher's perceptions of student interest concerning the implementation of specific agricultural topics was most positive for animals, crops and food processing, while soils, agricultural mechanics and agricultural economics received the least positive scores.

Teachers felt the greatest barriers to implementing agriculture into existing lessons were the time necessary for curricula changes and access to necessary supplies/materials/information. Lack of follow-up from the SAI coordinators was not perceived as a barrier to implementing agriculture into the curricula. Since time and information were barriers to implementation and lack of follow-up was not a barrier to implementation one might conclude that local resource persons with dependable local information can help to alleviate the time constraint factor.

In general, teachers participating in the agricultural literacy project, called Summer Agriculture Institute, perceive it to be well planned and appropriate to their own level of understanding, while being adaptable to the grade level they teach. Additionally, respondents generally used the information gained at the institute to enhance their existing curricula, some to a large extent. Changes in curricula to include agricultural material was a primary goal of the institute, therefore it could be concluded that the goal of increasing agricultural content in the K-12 curricula for participants had been met.

Recommendations

1. The research indicated that most of the teachers who participated in the agricultural literacy program were veteran teachers. Further research should focus on specific motives teachers have for enrolling in this program. Why don't younger teachers and teachers with less teaching experience participate in the Summer Agriculture Institute?

2. The purpose of the Summer Agriculture Institute was to encourage K-12 teachers to integrate agriculture into their existing coursework. However, 32.5% of the respondents indicated they integrated agriculture into five or fewer lessons during the course of a school year. Further studies should focus on qualitative research methods to identify individual teachers who are not implementing agriculture to determine what improvements could be made to the program to enhance its usefulness to this population.

3. Respondents identified a lack of access to necessary supplies, materials, and information as the second most common barrier for not implementing agriculture into their curricula. Further study should focus on specific supplies and materials that could be included during the agricultural literacy program that would eliminate this barrier for teachers. Furthermore, follow up studies could identify the information these teachers demand in order to increase the chances they will utilize the knowledge gained at the institute and/or determine the importance of local contacts for implementation and continued growth in agricultural knowledge and skill.

4. Finally, information gathered in the open ended question portion of this research indicated that different teachers found many of the same elements of the institute to be very popular. Further research should focus on the teacher perceptions of each section of the institute, and the correlation between teacher attitude toward the components of the agricultural literacy program and their ability and/or desire to integrate that specific section into their curricula.

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The Effects of an Agricultural Literacy Treatment on Participating K-12 Teachers and Their Curricula

A Critique

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The authors are to be commended for conducting a study to evaluate the success of their Summer Agriculture Institute. This is important step is identifying ways to improve such efforts.

The study sampled 81 participants but received responses from 52 for a 64.2% response rate. Were the other 36% that unhappy with the institute that they refused to participate any more? A follow up of nonrespondents is important or at least a comparison of early and late respondents would provide an indication of any differences in the nonrespondents and those who responded. The researchers reportedly use a 5 point Likeit-type scale with 36 statements on the section regarding teacher perceptions. No reliability however is reported for the instrument which is important in evaluating the data obtained.

This study identifies the fact that as a result of the Institute many students are now being exposed to agricultural literacy. Perhaps the next step would be to determine how much the students are gaining as a result of this new agricultural emphasis in the curriculum. The authors suggest further studies focus on qualitative research methods which are important if we are to determine the students level of knowledge relating to agriculture.

We need to provide more institutes for our K-12 teachers but we also need to be sure we learn all we can from each if we are to attract such teachers to attend.

Concurrent Session B

Theme:
Preservice
Preparation

Chairperson:
Richard I. Carter
Iowa State University

Discussant:
Christine D. Townsend
Texas A&M University

Facilitator:
Guy W. Denton
Utah State University

A Longitudinal Measure of the Perceptual Impact of a Cultural Diversity Teaching Practicum on the Interpersonal Competency of Student Teachers
Lloyd C. Bell, University of Nebraska

Current Status of Preservice Teacher Education Programs in Agriculture
Kirk A. Swortzel, Auburn University

Problems and Challenges Associated with the First Years of Teaching Agriculture: A Framework for Preservice and Inservice Education
John P. Mundt, University of Idaho
James J. Connors, University of Idaho

Student Teachers' Self-Perceived Level of Preparation for Teaching Agricultural Science and Technology
James J. Connors, University of Idaho
John P. Mundt, University of Idaho
Marvin Kleene, Washington State Univ.

A Longitudinal Measure of the Perceptual Impact of a Cultural Diversity Teaching Practicum on the Interpersonal Competency of Student Teachers

Lloyd C. Bell
University of Nebraska-Lincoln

Introduction/Theoretical Framework

"The rapid change in the ethnic demographics of the United States has made diversity one of the most significant social facts of this society. No longer is the occasion for an inter-cultural encounter most likely when one leaves ones' own country" (Avery,1992, p.3). As of 1992, over 50% of the enrollment in 50 of the largest 99 school districts in the United States was comprised by students of color. These districts comprise 23% of the total student population in the United States (Nieto, 1996, pp.12&13). It is a challenge for schools to help youth from diverse cultures and groups to attain the necessary knowledge, skills and attitudes to function effectively in the 21st century.

"Teachers play a key role in implementing multi-cultural education and helping students develop democratic racial attitudes and behaviors. Because they bring their own cultural perspectives, values, hopes, and dreams to the classroom, they are in a position to strongly influence the views, conceptions, and behaviors of students" (Banks, 1995, p. 333). Banks (1994, pp. 47-52) identifies four categories of knowledge in which teachers require a solid background in order to acquire attitudes, perceptions and behavior necessary to actualize multi-cultural education in schools. Those categories are (1) a knowledge of major paradigms in multi-cultural education; (2) a knowledge of the major concepts in multi-cultural education; (3) a historical and cultural knowledge of major ethnic groups; and (4) a pedagogical knowledge about how to adapt curriculum and instruction to unique needs of students from diverse cultural, ethnic, and/or social class groups. "If teachers are to work successfully with students from cultures different from their own, it is imperative that their training program provide for more than intellectualization about cross-cultural issues. Teacher growth in this area is possible only to the extent that the teacher's own behavior in a cross-cultural setting is the subject of examination and experimentation" (Hillard's chapter cited in Zeichner, 1995).

> "Probably the most frequently cited topic of discussion in the teacher education for diversity literature is the provision of some type of field experience to help sensitize prospective teachers to cultural differences and/or to help them become more capable cross-cultural teachers. A variety of typologies for staff development and several comprehensive lists of what are claimed to be research-based effective staff development strategies are offered in the staff development for diversity literature. However, there is little evidence that any of the staff development for diversity reported in this literature has been effective over the long term in producing anything more than surface-level changes in teachers or their teaching practices. As in preservice teacher education for diversity, what little success has been demonstrated seems to be closely linked with cultural immersion experiences" (Zeichner, 1995, pp. 407-413).

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Individual sensitization to cultural difference and/or appreciation of cultural diversity involves the consideration of behavioral change. Rokeach (1968) states that behavior is a function of two interacting attitudes. One is attitude focused on an object (cultural diversity), and the other is attitude being focused on the situation (treatment by cultural immersion). Behavior is an expression of attitude as differentially manifested along a range of values in relation to the specific interaction of the object(s) and the situation(s).

"Theories of attitude change seem to be generally unconcerned with whether an expressed behavior change does or does not represent an underlying attitude change. Indeed, the classical paradigm employed in experimental studies of behavior change - pre-test, treatment, post-test - is not capable of telling us whether an expressed behavior change indicates an attitude change; it can only tell us whether an expression of behavior has or has not changed as a result of a particular experimental treatment" (Rokeach, 1968 p. 140). "But, the more post-test situations in which a changed opinion is manifested, the more confident we may be that a change in attitude has actually taken place. Any experimental study of expressed opinion change, if it is to qualify as a study in attitude change, should demonstrate the existence of change in at least two reasonably different situations" (Rokeach, 1968 p. 148).

In 1993, Bell reported research results on a multi-cultural teaching field experience conducted at the University of Nebraska with student teachers of agricultural education and consumer science. In that research, student teacher perception was inventoried prior to and immediately following the field experience regarding behavioral teaching skills, cultural awareness, knowledge about cultural diversity, and student-teacher relationships. Those results reported perceptual interpersonal change in all of the areas in which the student teachers were inventoried. A recommendation of the study was to conduct a longitudinal follow-up of the participants to measure the longer term effects after at least one year on the interpersonal competency of the participants.

Purpose and Objectives

The purpose of this research was to evaluate the longitudinal effect of a planned practicum experience addressing cultural diversity on the self perception of student teachers regarding their interpersonal competency in such situations.

The objective of the research was to compare the longitudinal effect of the practicum experience to the measured differences obtained prior to and immediately after the experience in student teacher perception regarding: (1) behavioral proficiencies gained through teaching in a culturally diverse setting; (2) affective awareness of ones own culture and of differences in cultural values and biases; (3) cognitive understanding of theory, research and cross paradigmatic approaches to cultural diversity, and; (4) individual rights and the personal dignity of culturally diverse students in the teaching relationship.

Procedures

This study was a pre-experimental, one group, pre-test post-test design. In this design the effects of the treatment are judged by the difference between the pre-test and the post-test scores. No comparison with a control group or its equivalence is provided (Best, 1981).

The subjects of this study were all student teachers of agricultural education enrolled in the fall semesters of 1991 (n=10) and 1992 (n=8) in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln, and all student teachers of home economics education enrolled in the fall semester of 1992 (n=6) in the College of Human Resources and Family Sciences at the University of Nebraska-Lincoln. In the 1991 group of agricultural education subjects, two students chose to drop out of the experience. Of the remaining subjects, the post experience data on one individual was found to be missing, therefore, the reportable population was n=21. All 21 participants were included in the 1994 longitudinal data gathering, at which time, at least one year had elapsed since the practicum experience.

The original treatment was a six day, forty-five hour practicum experience at Flanagan High School in Omaha, Nebraska. Flanagan is an alternative high school maintaining a student population that is 85% African-American, 14% Eurocentric and 1% Hispanic (M. Tate, personal communication, December 1993). The experience included daily debriefing sessions, teacher shadowing activities, actual teaching experiences and issue oriented seminars. Prior to, and immediately after the experience, each student teacher completed a 32 item, multi-cultural attitudinal inventory. This same inventory was administered to the participants in 1994 to measure the longitudinal effect of the experience on their interpersonal competency in culturally diverse situations. The inventory was adapted for educational use from the larger 43 item Multi-cultural Counseling

Inventory (MCI) developed by Sodowsky, Taffe, Gutkin and Wise (1993). Adaptation of the inventory was completed by the researcher and Sodowsky. The inventory was reviewed for face and content validity by a panel of agricultural education and consumer science faculty members. The MCI author and panel judged the instrument to be valid. To assess student teacher perception, inventory responses were requested on a four-point Likert scale (1=very inaccurate, 2=somewhat inaccurate, 3=somewhat accurate, 4=very accurate) for each item. An example item to which student teachers rated their perception was, "I form effective learning relationships with minority students."

Within the inventory were four subscales: behavioral teaching skills, cultural awareness, knowledge about cultural diversity and student-teacher relationships. "Behavioral teaching skills" includes such competencies as recognition and ability to recover from cultural mistakes, effective self monitoring, and modifying teaching techniques to accommodate minority learner needs. "Cultural awareness" focuses in the affective domain and encompasses the educator's attitude toward their own culture, pro-active multi-cultural sensitivity and responsiveness, multi-cultural interactions and life experiences, advocacy within institutions, and enjoyment of multi-culturalism. "Knowledge about cultural diversity" covers the cognitive domain involving theory, research and cross paradigmatic approaches to understanding cultural diversity. "Student-teacher relationships" is based upon trust, absence of stereotyping, and comfort in a new, more diverse relationship. Internal consistency reliability (Cronbach alphas) for the inventory is reported in Table 1.

In addition to the MCI data, demographic employment information was collected during the follow up on the participants. This data categorized their current employment and tenure in that position, and whether their employment organization had provided experiences which had further enhanced their understanding of cultural diversity. Of the 21 responding participants, 2 failed to complete the demographic information section. Demographic related information reported is based on the 19 usable responses.

Table 1

Internal Reliability for the Modified MCI (Cronbach alpha)

Subscale	Pre-test	Post-test	Follow-up
All	.82	.85	.89
Skills	.56	.74	.62
Awareness	.75	.76	.86
Knowledge	.85	.72	.84
Relationship	.46	.58	.64

Analysis of the Data

The parameters of the population studied were derived using the Statistical Package for the Social Sciences (SPSS-X). Means and standard deviations were calculated for each subscale of items on the inventory.

Results

As indicated by the data reported in Table 2, perceptual change of interpersonal competency occurred within participants in all subscale areas measured in the follow-up.

Of the 19 respondents completing the demographic portion of the survey 12 were presently involved in secondary education, 2 were farming or ranching, 2 were involved in agribusiness sales, and the other 3 were a government employee, hospital administrator and social service agency employee. Nine of the respondents had received an opportunity provided by their current employer to enhance their understanding of cultural diversity.

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Table 2

Comparison of Pre, Post and Follow-up Multi-cultural Inventory Subscale Mean Scores (N=21)

Subscale	Pre	SD	Post	SD	Follow-up	SD
Skills	3.12	.41	3.27	.44	3.31	.38
Awareness	2.20	.46	2.48	.50	2.30	.61
Knowledge	2.86	.51	3.24	.41	3.02	.55
Relationship	2.95	.41	2.82	.53	3.29	.46

Note. Means based on a scale in which 1=poor multi-cultural competence, 2=fair multi-cultural competence, 3=good multi-cultural competence, and 4=strong multi-cultural competence.

Conclusions and/or Recommendations

Because of the design used in this study, the results are generalizable only to the participants involved. With this limitation in mind, the following conclusions and recommendations are provided.

Through the results of this follow-up procedure it is evident that behavioral change has occurred in the participants, as it relates to multi-culturalism, in the areas of teaching skills, knowledge of cultural diversity, and teacher-student relationships.

The greatest gain in self perceived interpersonal competency by participants was in the area of teacher-student relationships. This area focused on the participants' interactional process with minority clients/students regarding trustworthiness, comfort level, stereotypes of minority populations, and general world-view of multi-culturalism. During the practicum experience this was an area in which the participants' scores decreased. It was the researcher's conclusion that the decrease was due to participants becoming aware of their unconscious bias. Vance (1982) describes this awareness as conscious incompetence. When individuals become aware of an inconsistency, in this case bias, they make a decision of whether to change their attitude and/or behavior regarding the issue. Should they decide to change Vance describes their new stage as conscious competence. Should they approve of this new behavior to the extent of accepting it into their affective behavior, Vance describes this stage as unconscious competence. At the time of the follow-up, participants were engaged in career situations requiring practice and self monitoring of these interpersonal relationship skills. In the demographic information, participants reported that their employers had provided them with experiences such as training sessions and routine interaction with minority clientele to further enhance their understanding of cultural diversity.

The subscales of student-teacher relationship and behavioral teaching skills while distinctly different share the common element of student interaction. The subscale of behavioral teaching skills includes participant ability to recognize and recover from cultural mistakes, use of non-traditional methods of assessment, and participant self monitoring. All of these competencies are involved in effective interpersonal relationships. Confidence in self perceived competency is developed from situational use in their careers and inservice provided by employers.

The subscale of knowledge about cultural diversity measured the participant ability to conceptualize culturally relevant lesson planning and assessment strategies, familiarity with cultural information and awareness of multi-cultural teaching research. The follow-up score has regressed from the score reported on the post-test. To evaluate this regression would require another follow-up to assess if the score continues to decline over time. Based on the content of this subscale and the similar focused knowledge intent of the practicum seminars, it may not be surprising that the score immediately following the practicum would be higher.

In this research, the mean score for awareness has always been the lowest of the subscales. The follow-up score has regressed since the post-test, but continues to be above the initial pre-test score. This subscale focuses on the affective domain and encompasses the educator's attitude toward their own culture, proactive multi-cultural sensitivity and responsiveness, multi-cultural interactions and life experiences, advocacy, and enjoyment of multi-culturalism. Affective behavior is largely influenced by ones' own culture, life experiences and selected significant others (Hanna, 1995). These are the very ingredients through which individuals clarify values upon which they base personal decision making. In relation to Rokeach's (1968) theory on behavior and attitude, the relative stasis attained throughout the research period by participants on cultural awareness may indicate little change in attitude toward multi-culturalism as a separate personal value. However, behavioral change of attitude has been expressed through situations when interacting in client/student-teacher relationships, demonstrating adaptive teaching behavior, or making use of knowledge regarding cultural diversity.

It is recommended initially that preservice and inservice activities for teachers regarding cultural diversity focus on situational knowledge content and its application rather than the affective change of teacher's personal values. The knowledge content recommended by Banks (1994, pp. 47-52) is (1) a knowledge of major paradigms in multi- cultural education; (2) a knowledge of the major concepts in multi-cultural education; (3) a historical and cultural knowledge of major ethnic groups; and (4) a pedagogical knowledge about how to adapt curriculum and instruction to unique needs of students from diverse cultural, ethnic, and/or social class groups. The process of affective teacher attitude change is a slow process marked by the time it takes to move through the stages of awareness, interest, evaluation, trial and adoption. It may require a series of situational changes related to teaching behavior or student-teacher relationships in order for teachers to consider a change or addition to their affective awareness regarding cultural diversity. If attitude change is to occur in teachers it will do so as a result of satisfaction from the change. This will involve the need for an environment in which the change seems logical, and the satisfaction is real and elicits sincere praise and reinforcement (Ruud, 1971). To establish an environment of satisfaction for teacher performance, it is recommended that those in position to do so create meaningful opportunities for multi-cultural experiences within the school curriculum. It is further recommended that a portion of the reinforcement for teacher behavioral change be linked to meaningful multi-cultural inservice activities and opportunities such as (Lynch, 1995):

1. More cooperative modes of education ..... yielding students who are less competitive and can work with, live with and tolerate others.
2. Youth groups and exchange agencies ..... can have a powerful socializing influence on young people.
3. Holistic institutional policies ..... are needed to make interethnic contact purposeful and successful, whether in school or youth organizations.
4. Strategies regarding how teachers teach and what they teach ..... should be designed to make a positive difference in the interethnic relations of students.
5. The learning of foreign language ..... provides students with insight into other cultures, and a more detached view of their own culture.
6. Opportunities to facilitate the transition of students from school to work ..... can minimize the perils of unemployment and better promote youth socialization.

It is recommended that colleges and universities with the mission of preparing teachers continue to provide students with multi-cultural experiences both of a formal and informal nature. The college experience is a great socializing influence. Even though 23% of the nation's total student population is enrolled in culturally diverse schools (Nieto, 1996), for much of the remaining 77% it may be the first opportunity to live in and socialize with others from a culture different than their own. Colleges and universities should promote this opportunity to enhance diversity involvement of their students. Considerations for this promotion should be: (1) equal representation of minority populations in faculty and administrative positions, (2) required participation in volunteer activities within the greater university community, (3) required course work addressing diversity, (4) encouragement for student organizations to address diversity issues in their annual programs of activity, (5) encouragement of teaching faculty to integrate the method of cooperative learning into their delivery of instruction, and (6) assignment of personnel for the specific purpose of recruiting minority populations and the facilitation of financial aid and assimilation to the university community. There are many considerations in addition to these, but the primary focus is to provide students with an increased number of situations in which to evaluate their attitudes regarding diversity. Within university departments, there is the opportunity to shape these situations to uniquely address specific missions. It is recommended that in a department preparing teachers those situations be guided by the four categories of knowledge recommended by Banks (1994, pp. 47-52) identified earlier in this report. Such learning activities will set the stage for local school districts by providing teachers prepared to proceed with purposeful applications of multi- cultural education in their own curriculum.

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A Longitudinal Measure of the Perceptual Impact of a Cultural Diversity Teaching Practicum on the Interpersonal Competency of Student Teachers

A Critique

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Cultural diversity is a critical aspect of teacher preparation programs because public schools are rapidly becoming more diverse with each new kindergarten class. In this research project, Bell addressed a crucial and momentous need for teachers of agriculture. The impact of the public school's cultural mix was presented in the introduction to the paper. The reader quickly realized that the future is now. Public school populations have already changed and we must blend diversity into our future teachers' educational preparation.

The scholarship of this paper was intriguing. By utilizing a longitudinal procedure, the researcher provided results that were stronger than a one-shot snapshot in time. In fact, Bell provided a framework that suggested if we desire attitudinal changes, research must be planned to go beyond the traditional pre-test, treatment, post-test designs. The use of the longitudinal design was an attempt to discover if we can change attitudes about a sensitive, yet monumental aspect of a teacher's career.

The researcher correctly noted that the conclusions not be generalized beyond the population of the study. However, this research project was fascinating and had great implications for the profession. For example, the result that the students' view of multi-culturalism decreased was well discussed by the researcher. He appropriately surmised that one's attitudes may actually decrease or weaken when one experienced the real situation. While simulations, discussions, and class projects bring an awareness of multi-culturalism, they may create a "temporary" attitudinal response. Certainly students need to study diversity to gain an awareness of multi-culturalism but the results of this research project strongly suggested we somehow find methods to help students cross into reality.

As Bell suggested, it is imperative that this longitudinal study be continued. What changes in attitude will occur over time? Similarly, the questions of what incidences and educational experiences impact one's attitude have implications for the teaching program addressed in this study. As the researcher questions the respondents in the future, factors relating to changes or stabilization of attitude should develop implications for both pre-service and in-service programs. We need to ascertain why attitudes are affected while teachers are on the job. Do they become more sensitized to a multi-cultural environment? Do they become more hostile? How does the changing demographics of a particular high school affect attitudes? How will 10 years of experience affect the teachers' attitudes? These questions as well as countless others will no doubt be expressed in future studies of these respondents.

Bell recommended departments address the four categories of knowledge concerning multi-cultural education (paradigms, concepts, history, and curriculum adaptation). Educationally, we have the power and methodologies to teach the cognitive aspects of diversity issues. However, based on this study and its

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theoretical framework, the success of teachers will be based on more than learning about multi-culturalism. The impact of this study suggests future teachers experience multi-cultural situations. With this recommendation and the results of the study, departments are equipped with a primary point of discussion to visit or revisit diversity issues in the pre-service and inservice programs. It is hoped that from research such as this study, educational shifts continue to prepare teachers to meet the needs of their student clientele.

Current Status Of Preservice Teacher Education Programs In Agriculture

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Introduction and Theoretical Framework

For years, educators have been hearing about the changing society and a changing occupation of teaching. During the 1980s, American education was severely criticized in the way students were performing in the classroom and for the declining quality of schools, curricula, and teachers. National reports such as A Nation at Risk (1983), Staffing the Nation's Schools: A National Emergency (1984), Tomorrow's Teachers (1986), A Call for Change in Teacher Education (1985), and A Nation Prepared: Teachers for the 21st Century (1986) all chronicled the need for the recruitment and preparation of talented individuals to enter the teaching profession.

A Nation at Risk (1983) said that teaching majors should be required to meet high educational standards, to demonstrate an aptitude for teaching, and to demonstrate competence in an academic discipline. The Holmes Group (1986) called for extended programs of teacher education and stronger evaluation of candidates for entry, retention, and licensure in teacher education. A Call for Change in Teacher Education (1985) suggested that more rigorous academic and performance standards for admission into and graduation from teacher education programs was the solution to the problem of not having quality individuals entering the teaching profession.

Although teacher education programs have been implicitly or explicitly held accountable for many of the perceived failures of public education, many early education reports focused primarily on reform of the curriculum for public school students and not that of preservice students (Lynch, 1990). These reports helped provide the impetus that resulted in significant changes in teacher education and state-required certification in the mid 1980s. This impetus prompted a reform movement based on the grounds that school improvement must begin with upgrading the quality of those who enter the teaching profession (Lynch & Griggs, 1989). This led to another wave of reform that looked at teacher test scores, subject-matter credit or degree requirements, hours or weeks of required clinical experiences, and so forth in the teacher preparation program.

Every effort must be made to recruit, select, and retain well-prepared individuals for preservice teacher education programs (Darling-Hammond & Cobb, 1996). Once these students have been selected and admitted into teacher education programs, they must be equipped with the knowledge, skills, and dispositions that will enable them to succeed with all students. Furthermore, teachers need to be prepared to teach in ways new standards demand, with deeper understandings of their discipline, interdisciplinary connections, and inquiry-based learning (Darling-Hammond, et al., 1996).

The dearth of research in teacher education has not helped answer the challenges brought forth by commission reports. This lack of research can be attributed to the difficulty in defining a teacher educator and the teacher education population (Ashburn, Mann, Barrett & Schneiderman, 1988). Research in teacher education has also been classified as less salient than other lines of education research or that it has been and may always be unimportant (Lanier & Little, 1986; Troyer, 1986; Lynch, 1988).

Research on vocational teacher education is relatively nonexistent. Lynch (1990) collected data in an effort to provide baseline data on preservice teacher education programs in the United States because such data was not included or was not segmented in larger studies on teacher education. Lynch's attempt was to help provide the necessary data to help base policy and teacher education reform decisions in vocational education. Data on agriculture teacher education programs was included in his study, but like in past research in teacher education, this data was not specifically segmented.

Requirements to both enter and exit a vocational teacher education program were a 2.5 cumulative GPA, a 2.5 GPA in an academic major, and a 2.5 GPA in education courses (Lynch, 1990). The curriculum anatomy of a vocational teacher education student was as follows: 128 semester hours required for graduation with 47 semester hours (37%) in general studies, 43 semester hours (34%) in subject-matter courses (teaching specialty), and 38 semester hours (29%) in professional studies (including student teaching).

In 1988, the Committee on Agricultural Education in Secondary Schools made six recommendations regarding teacher education in agriculture. The Committee recommended that: (1) applied learning be stressed as well as strengthening science, technology, economics, agribusiness marketing and management, international agriculture, and public policy; (2) technology transfer be improved; (3) partnerships be developed to deliver in-service programs; (4) centers be established for curriculum design; (5) linkages be developed with science, business, and educational technology; and (6) talented students are to be recruited into the teaching profession.

Cruickshank (1984) proposed a model to help guide inquiry in teacher education and enable teacher education to merge as a discipline. Two of the components of Cruickshank's model proposed for inquiry were the contexts of teacher education and the curriculum in teacher education. The context of teacher education dealt with institutional characteristics of teacher education programs, like size of programs and composition of faculty and staff. Curriculum in teacher education refers to the nature and amount of the content of the preservice curriculum, including general education, professional education, and the teaching specialty.

Where does agriculture teacher education fall in the broad picture? If we are to meet the challenge brought forth by the Committee on Agricultural Education in the Secondary Schools (1988) on preparing our students to be prepared more in the business and science of agriculture, how well is the profession preparing students today? What are our admission requirements? What curriculum is being used? Before we can make substantial policy changes in teacher preparation in agriculture, our current status must be defined to know where we are.

Purpose and Objectives

The purpose of this study was to describe the current context and status of agriculture teacher education programs in the United States. Specific objectives of the study were to:

1. Describe the institutional characteristics of agriculture teacher education programs
2. Describe admission requirements of agriculture teacher education programs
3. Describe curricula completed by preservice students in order to graduate with a major in agricultural education

Methods and Procedures

Survey research methods were use to collect data for this study. The purpose of survey research is to describe the characteristics of a population (Fraenkel & Wallen, 1996). With survey research, the researcher wants to find out how members of a sample or population distribute themselves on one or more variables. Kerlinger (1986) commented that survey research is used to describe the present status or present an accurate description of the incidence and distribution of phenomena. In survey research, the purposes of the study are manifested in the objectives used for the study.

The population for this study was all departments and programs at colleges and universities in the United States during the 1995-96 academic year offering degree programs preparing and certifying agricultural education teachers (N = 85). These departments and programs were identified using the Directory of Teacher Educators in Agriculture (Shelhamer, 1995). The entire census was surveyed in the study.

A questionnaire was used to collect data on agricultural education departments/programs. Questions for the questionnaire were developed using the Lynch (1990) study on vocational teacher education departments. The questionnaire consisted of four parts. Part one collected information regarding institutional characteristics of agriculture teacher education programs. The second part collected information regarding the admission requirements of preservice teacher education students. Information on curricula requirements for agricultural education majors was collected in part three. The final part identified instructional alternatives used by teacher educators when delivering the curricula for preservice teacher educators. Only data from the first three parts are included in this paper.

Appropriate mailing and follow-up procedures, as outlined by Salant and Dillman (1994) were used in the study. Seventy-three of 85 departments/program area questionnaires had been returned after the third mailing for a response rate of 86%. To address non-response error, five departments/program areas that had not responded were contacted and asked a set of purposefully selected questions. Responses from non-respondents were compared to respondents and no significant differences were found, thus allowing the results to be generalized to the population.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS Version 6.1 for Windows). Descriptive parameters, including frequencies, percentages, means, medians, modes, ranges, and standard deviations were used to organize, summarize, and analyze data.

Results

Institutional Characteristics

Preservice teacher education programs in agriculture are primarily housed in colleges or schools of agriculture. Forty-three of the 73 departments/programs (59%) had an affiliation with a college or school of agriculture. Seventeen of the 73 departments/ programs (23%) were administered through colleges or schools of education. The remaining 12 departments/programs (18%) were either administered through colleges of business or technology.

When asked what is the name of their department, 34 of the 73 departments/programs (46%) had the words "agricultural education" in the department name. Twenty-one departments/programs (29%) had department names relating to various aspects of technical agriculture. The remaining 18 departments/programs (25%) were in vocational education, technology, or education (curriculum and instruction).

Table 1 reports nominally scaled institutional characteristics of agriculture teacher education programs in the United States. Of the 73 responses received, 86% of the departments/programs were on the semester calendar system and 14% were on the quarter calendar system. Eighty-one percent of the departments/programs reported they had four-year degree certification programs, 18% had five-year degree certification programs, and 1% reported their degree certification program could be either a four year or a five year program. Ninety-six percent of agriculture teacher education programs had some type of accreditation, either through the National Council for the Accreditation of Teacher Education (NCATE), North Central Region, Western States, National Association of State Directors of Teacher Education Commission (NASDTEC), Southern Association of Colleges and Schools (SACS), or Middle States. Four percent of agriculture teacher education programs were not accredited.

The number of teaching majors in agricultural education departments/program areas for the 1995-96 academic year ranged from 0 to 200 students, with an average of 41 teaching majors per department/program area (standard deviation = 37.6). The number of full-time equivalents (FTE's) devoted to agriculture teacher education in departments/ programs for the 1995-96 academic year ranged from 0.00 to 6.12. The average number of FTE's per department/program area was 1.7 (standard deviation = 1.28). These data are reported in Table 2.

Table 1

Nominally Scaled Institutional Characteristics of Agriculture Teacher Education Programs (n = 73)

Characteristic	Frequency	Percentage
Calendar Schedule		
Quarter	10	14
Semester	63	86
Length of Program		
Four Year	59	81
Five Year	13	18
Either Four Year or Five Year	1	1
Accredited		
Yes	70	96
No	3	4

Table 2

Intervally Scaled Institutional Characteristics of Agriculture Teacher Education Programs (n = 73)

Characteristic	Mean	SD	Range	Mode	Median
Number of Teaching Majors	41.3	37.6	0 - 200	20	30
FTE's	1.7	1.28	0 - 6.12	1	1.5

Admission Requirements

Part two of the questionnaire asked a series of questions regarding admission requirements to be met by preservice students in agriculture teacher education. A summary of these admission requirements is reported in Table 3. Sixty-seven departments/programs reported a minimum grade point average (GPA) was required for admission into the teacher education program. Minimum GPAs required of preservice students for admission into teacher education ranged from 2.00 to 3.00 (on a 4.00 point scale) with a median GPA of 2.50.

A series of questions was asked to respondents to indicate which tests could be taken by preservice students for admission into the teacher education program and what minimum scores were required for these tests (Table 3). Twenty programs (27%) indicated no tests were required for admission. Twenty-five departments/programs (34%) required a minimum score on the American College Test (ACT). Minimum scores on the ACT for 20 institutions who provided this data ranged from 16 to 23 with a median ACT score of 20. Eleven programs (15%) required the Scholastic Aptitude Test (SAT), of which 8 reported the minimum combined verbal and quantitative score required. Minimum scores required on the SAT ranged from 800 to 1050 with a median SAT scored of 922. The Pre-Professional Skills Test (PPST) was an option for preservice students majors at 22 institutions. Twenty institutions (27%) provided minimum scores required on the PPST for admission into teacher education. Minimum scores required on the PPST Math portion ranged from 168 to 174 with a median score of 170. The median PPST Reading scored required was 172 (range = 169 to 176). Minimum PPST scores on the writing portion ranged from 170 to 175 with a median PPST writing score of 172.

Table 3

Admission Requirements for Agriculture Teacher Education Programs

Criteria	f	Median	Range
Grade Point Average	67	2.50	2.00 - 3.00
ACT Test	20	20	16 - 23
SAT Test	8	922	800 - 1050
PPST - Math	20	170	168 - 174
PPST - Reading	20	172	169 - 176
PPST Writing	20	172	170 - 175

f = number of departments/programs providing this data

Departments/programs were asked whether a personal interview and letters of recommendation were required for preservice students to be admitted into teacher education. Forty-seven percent (f = 34) indicated that an interview was required and 53% (f = 39) responded that a personal interview was not required. Seventy percent of departments/programs (f = 51) responded that letters of recommendation were for required for admission while 30% (f = 22) indicated letters of recommendation were required for admission into teacher education. The number of letters of recommendation ranged anywhere from 1 to 4 with a median of 3 letters of recommendation.

A series of open-ended questions was asked about the desirable qualities departments/ programs looked for in teaching majors regarding suitable attitudes toward teaching, leadership qualities, agricultural work experience, and experiences working with youth and children. Agricultural education departments/programs looked for excellent communication skills, an empathy for youth, an interest in the teaching profession, and a positive attitude toward the teaching profession. In terms of exhibiting leadership skills, teaching majors should be former members of the FFA and/or 4-H, have strong communication skills, and be actively involved in university clubs and activities.

Most departments/programs required between 2,000 and 4,000 hours of work experience in some phase of agriculture. Students could attain some work experience while they were in college besides that attained while in high school. Departments/programs desired that preservice students have some experience working with youth organizations like FFA, 4-H, or church youth groups.

Curricula Requirements

Respondents were asked to indicate the total number of credit hours needed by preservice students to graduate with a major in agricultural education with teacher certification. Respondents were then asked to indicate the number of credit hours that were in general education (arts and humanities, math, natural science, social science), technical agriculture, and professional education (professional studies, agricultural education, humanistic and behavioral studies, teaching and learning theory, and practica).

Table 4 reports the minimum number of quarter hours required to be completed by teaching majors to graduate with a major in agricultural education with teacher certification. For the five departments/programs having a four year degree certification program, the number of quarter hours ranged from 186 to 220 with an average number of 201.6 quarter hours required for graduation. Of these hours, teaching majors had to complete on average 67.2 quarter hours in general studies (range = 33 to 93 quarter hours), 56.4 quarter hours in technical agriculture (range = 44 to 75 quarter hours), and 47.4 quarter hours in professional studies (range = 45 to 50 quarter hours).

For the four departments/programs having a five year degree certification program, the number of quarter hours ranged from 180 to 243 with an average number of 207.0 quarter hours required for graduation. Of these hours, teaching majors had to complete on average 60.3 quarter hours in general studies (range = 35 to 85 quarter hours), 77.8 quarter hours in technical agriculture (range = 66 to 104 quarter hours), and 62.3 quarter hours in professional studies (range = 48 to 92 quarter hours). These data are also reported in Table 4.

Table 4

Quarter Hours Required for Graduation With a Major in Agricultural Education With Teacher Certification

Course Description/Length of Program	n	Range	Mean	Median
Total Hours				
Four-year program	5	186 - 220	201.6	200.0
Five year program	4	180 - 243	207.0	198.0
General Studies				
Four year program	5	33 - 93	67.2	70.0
Five year program	4	35 - 85	60.3	61.0
Technical Agriculture				
Four year program	5	44 - 75	56.4	57.0
Five year program	4	66 - 104	77.8	70.5
Professional Studies				
Four-year program	5	45 - 50	47.4	48.0
Five year program	4	48 - 92	66.3	62.5

Table 5 reports the minimum number of semester hours required to be completed by teaching majors to graduate with a major in agricultural education with teacher certification. For the 53 departments/programs having a four year degree certification program, the number of semester hours ranged from 120 to 148 with an average number of 130.5 semester hours required for graduation. Of these hours, teaching majors had to complete on average 44.7 semester hours in general studies (range = 22 to 70 semester hours), 42.8 semester hours in technical agriculture (range = 3 to 63 semester hours), and 35.8 semester hours in professional studies (range = 22 to 60 semester hours).

For the nine departments/programs having a five year degree certification program, the number of semester hours ranged from 120 to 165 with an average number of 138.7 semester hours required for graduation. Of these hours, teaching majors had to complete on average 51.2 semester hours in general studies (range = 40 to 63 quarter hours), 47.3 semester hours in technical agriculture (range = 30 to 66 semester hours), and 46.6 semester hours in professional studies (range = 31 to 61 semester hours). These data are also reported in Table 5.

Respondents were asked to indicate if preservice students were required to complete early field experiences in agricultural education before student teaching. Ninety-three percent of the respondents indicated that an early field experience was required before student teaching while the remaining 7% of departments/programs did not require an early field experience to be completed. Those departments/programs who required an early field experience were asked to indicate the minimum number of clock hours teaching majors were required to spend in the early field experience. For the 56 departments/program areas providing this data, the number of clock hours teaching majors were required to spend in an early field experience ranged from 16 to 200, with an average of 60.2 clock hours (standard deviation = 38.2).

Table 5

Semester Hours Required for Graduation With a Major in Agricultural Education With Teacher Certification

Course Description/Length of Program	n	Range	Mean	Median
Total Hours				
Four-year program	53	120 - 148	130.5	131.0
Five year program	9	120 - 165	138.7	131.0
General Studies				
Four year program	53	22 - 70	44.7	45.0
Five year program	9	40 - 63	51.2	49.0
Technical Agriculture				
Four year program	53	3 - 63	42.8	46.0
Five year program	9	30 - 66	47.3	48.0
Professional Studies				
Four-year program	53	22 - 60	35.8	35.5
Five year program	9	31 - 61	46.6	45.0

Departments/programs were asked if preservice students were required to complete student teaching. Ninety-nine percent of the respondents (f = 72) indicated that student teaching was required while the remaining 1% (f = 1) indicated that student teaching was not required. The minimum number of weeks teaching majors were required to be out student teaching ranged from 10 to 24 weeks, with a median of 12.0 weeks per student teacher.

Departments/programs were asked to indicate whether teaching majors were required to complete courses or course work in multicultural education, exceptional children, and computers/instructional technologies. These data are reported in Table 6. Seventy-one percent of the respondents required their teaching majors to complete course work in multicultural education, 75% required their teaching majors to complete course work in exceptional children, and 88% required majors to complete course work in computers and instructional technologies.

Table 6

Special Course Work Required of Teaching Majors in Agricultural Education (n = 73)

Course	Frequency	Percentage
Multicultural Education	52	71
Exceptional Children	55	75
Computers/Instructional Technologies	64	88

Conclusions/Recommendations/Implications

The data and information presented in this paper provide baseline data on preservice teacher education programs of agricultural education in the United States. The results of this survey research are intended to overcome the lack of knowledge about where, what, how, to whom, and by whom agriculture teacher education is provided. It is hoped that the data and information will initiate a framework for future research efforts that will improve and strengthen the role and effectiveness of agriculture teacher education.

Most preservice teacher education programs are accredited and administered in Colleges of Agriculture. A typical preservice teacher education program will have 41 preservice students educated by 1.7 full-time equivalent (FTE) faculty members in agricultural education. Most of the degree certification programs in agricultural education for preservice students are four-year programs following a semester calendar.

Departments/programs admitting students into teacher education require a 2.50 minimum grade point average (on a 4.00 point scale) for entry. Tests required for admission into teacher education vary by institution as well as minimum scored required. Personal interviews and letters of recommendation are not the norm for students to gain admission into teacher education. Departments desire students who have excellent communication skills, have previous experience in 4-H and/or FFA, and who are active in college activities. These students must also have substantial work experience in agriculture, which may be attained in college if need be.

Generally, the curriculum anatomy of an agriculture teacher education student is as follows: 131 semester hours; approximately 34% (45 semester hours) of those credits are in general education, 33% (43 semester hours) of those credits are in technical agriculture, and 28% (37 semester hours) of those credits are in professional education. Preservice students must complete course work in multicultural education, exceptional children, and computers/instructional technologies. Preservice students complete approximately 60 clock hours in an early field experience program and spend 12 weeks student teaching.

Departments and program areas should establish criteria for admission that will allow qualified candidates to enter teacher education. Departments/programs should establish criteria that include attitudes toward teaching, completing diverse agricultural experiences, and diverse experiences in working with youth and children. If agricultural education teachers are to have stronger backgrounds in business and science, efforts should be make to recruit individuals who have strong backgrounds in these areas or provide opportunities in the preservice teacher education program to allow preservice teacher education students to experience and learn how to integrate science and business into the agricultural education curriculum.

What type of experiences do teaching majors encounter in early field experience programs and student teaching? As teacher education programs plan early field experiences and student teaching activities, efforts should be made to provide preservice teacher education students opportunities to work with academic teachers in integrating agriculture into the curriculum as will as providing experiences in different school settings so preservice students can work with students of difference backgrounds and different agricultural settings.

Curricula used to prepare preservice teacher education students should contain sufficient number of hours in natural science as it applies to the science of agriculture being taught in high school agricultural education programs. Preservice teacher education students should also complete course work on how to deal with special and diverse populations. Furthermore, early field experiences and student teaching experiences should provide opportunities for preservice students to work with special populations.

While this study provides a good foundation from which to look at agriculture teacher education, further research needs to be conducted in the following areas:

1. Replicate this study every five years to ascertain the status of the profession and to determine trends regarding teacher education in agriculture.
2. Determine the effects and benefits of preservice students completing a four-year degree certification program or a five-year degree certification program.

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Current Status of Preservice Teacher Education Programs in Agriculture

A Critique

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When an organization prepares a vision for the future, it is necessary to look at its current status as well as the history of past actions. Similarly, for the Agricultural Education profession to create future plans, it is imperative to have such information. In this study, Swortzel provided necessary baseline data to describe the Agricultural Education profession. The theoretical framework contributed details which showed that vocational education information, specifically, agricultural education was limited. Therefore, this study was critical and provided crucial information to fill gaps and supply a state of the art description. It was appreciated that Swortzel took on this task.

The methodology utilized for this study was appropriate and the high response rate signified that the profession was committed to this effort. Swortzel correctly questioned non-respondents to determine no bias from the departments who choose not to participate in the study. As with any research, questions were developed beyond the scope of the study. In this instance, one wondered, why did some departments choose not to participate. Did they think they did not fit the study parameters or were the departments in some type of transition? These curiosities were interesting sidelights developed from Swortzel's work and were asked as a point of conversation.

In assessing the conclusions, recommendations, and implications, one major question was asked. How did the data reported affect the questions addressed in the introduction. The theoretical framework provided an excellent collection of recommendations for teacher education. Institutions such as the Committee on Agricultural Education in Secondary Schools, The Holmes Group, and A Call for Change in Teacher Education were referenced with their suggestions for improvement in teacher education. From this study, could we assess our compliance? What did the data indicate for stated teacher education goals? Are we complying with the recommendations of the Committee on Agricultural Education in Secondary Schools (1988) in these areas:

1. applied learning (in)...science, technology, economics, agribusiness..., international...and public policy
2. technology transfer
3. partnerships (for) in-service programs
4. curriculum design centers
5. linkages ...with science, business, and educational technology
6. recruiting talented students

It would be helpful to the reader to find these direct comparisons in the body of the paper and these comparisons may be planned for future publications. It is hoped that Swortzel will continue to analyze the data to blend the agricultural education information with the previously-published recommendations for teacher education.

Another future project should be a comparison with the Lynch report on vocational teacher education. As one investigates the Lynch curriculum figures (37% general, 34% specialty, 29% professional), how do the Agricultural Education requirements relate? A table showing a similar breakdown would be helpful to the reader. Beyond the comparison, however, is the question of quality. Does the Lynch report suggest the curriculum figures are best? What recommendations for vocational teacher education preparation did Lynch make? And, do the agricultural education curriculum requirements supply students with the best combination of classes and subjects? These questions reinforce the wealth of information made available by Swortzel's study but appeal for additional analysis. Swortzel is commended for his work at collecting baseline data concerning teacher preparation in agricultural education. This data is a valuable resource for the profession to evaluate its current position and vision its future.

Problems and Challenges Associated with the First Years Of Teaching Agriculture: a Framework for Preservice and Inservice Education

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Introduction and Theoretical Framework

Entry into the profession of teaching high school agriculture can be difficult at best. Nesbitt (1991) noted that agriculture teachers are not only held responsible for the activities of a regular subject matter teacher such as classroom management and subject content, but beginning agriculture teachers are additionally responsible for the many activities associated with a total program of vocational agricultural education. Studies concerning problems associated with the first years of teaching confirm the often difficult transition into the profession. Veenman (1984) in an extensive review of 91 studies conducted after 1964 which dealt with problems of beginning teachers across disciplines, found the most reoccurring problems were: classroom discipline, motivating students, dealing with individual differences, assessing students' work, relationships with parents, organization of class work, inadequate teaching materials and supplies, and dealing with problems of individual students. Researchers (Nichols & Mundt, 1996; Heath-Camp & Camp, 1992; Mundt, 1991; Barrick & Doerfert, 1989) confirm some of the same problems for agriculture teachers as identified by Veenman. Consistently, classroom management and student discipline come to the forefront as problems for beginning teachers. They also found that additional problems included: managing the vocational student organization, facility management, safety and health, and global organizational issues.

Problems related to the first years of teaching can be translated to inservice needs of first year teachers. Research related to the inservice needs of beginning teachers of agriculture and attributes of beginning teacher induction programs (Garton & Chung, 1996; Nesbitt & Mundt, 1993; Barrera & Finley, 1992) supported a link between problems incurred and inservice education needed and/or provided. Often, benefits cited as a result of induction and inservice education were the enhancement of technical knowledge and pedagogical skill, however, those activities which boosted teacher moral and provided encouragement during the first year were reported to be very important. Flowers & People (1988), recommended teacher educators and state supervisors develop programs which would boost teacher morale.

The literature reviewed for this study found that beginning teachers of agriculture were surveyed during their first year of teaching. Additionally, beginning teachers' principals, teacher educators, and state supervisors of agricultural education were also surveyed. In most cases these were census studies within certain states or regions of the United States and the research focus dealt with the problems and inservice needs of beginning teachers of agriculture. This research effort also focused on the problems and challenges of the first years of teaching agriculture. The research approach, however, was different from other recent studies as follows: 1) it was a national Delphi study, 2) participants were those beginning teachers who had taught from three - five years, and 3) the participants were declared state winners in the NVATA (National Vocational Agricultural Teachers Association) Outstanding Young Member Award Program. The researchers were interested in comparing the responses of beginning teachers who were named outstanding agriculture teachers as determined by their selection as state winners of the NVATA Outstanding Young Member Award with the results of other studies that investigated the problems faced by first year agriculture teachers.

Purpose and Objectives

The purpose of this Delphi study was to utilize the expertise of the state winners of the NVATA Outstanding Young Member Award in identifying problems and challenges associated with the first years of teaching agriculture. Specific objectives of the study were:

1. To identify a list of problems and challenges associated with the first years of teaching agriculture.
2. To determine a priority ranking of problems and challenges as determined by participants in the study.
3. To reach consensus on the priority ranking of problems and challenges using the Delphi process.
4. To compare the results of this study with other research efforts dealing with the problems and challenges associated with the first years of teaching agriculture.

Methods and Procedures

The study was conducted using a three round Delphi technique to identify problems and challenges associated with the first years of teaching agriculture. The Delphi is a group process technique of eliciting, collating, and generally directing informed (expert) judgement toward a consensus on a particular topic (Delp et al., 1977, p 168). The population (panel of experts) for the study was the NVATA Outstanding Young Member Award state winners for the years 1995 and 1996. The list of names and addresses was provided by the national office of the NVATA. The list included 61 different names for the two years. In some cases the same individual may have received the award for two consecutive years and in other cases not all states had declared a state winner in the program for each year, which explains the number less than the total possible of 100. After the first round mailing and follow-up phone call it was found that seven of the participants had either changed occupations or had moved to another school. Therefore, the final population for the study was 54 agriculture teachers.

The three round Delphi process was conducted from February 20 through April 30, 1997. The process included three mailings and follow-up phone calls to those who had not responded by the requested date. The study included a series of three surveys. All surveys were developed and checked for content validity by faculty in the Department of Agricultural and Extension Education. The first survey contained an open ended question asking the respondents to list up to ten problems and challenges associated with the first years of teaching agriculture. The resulting list of problems and challenges was placed into 23 categories which resulted in the content for the second survey. For the second survey the respondents were asked to rate the level of importance for each category on a Likert-type scale with 1=not important, 2=slightly important, 3=important, and 4=very important. The third and final round of the process resulted in a survey which was identical to the second round survey except the individual responses and the group responses were reported for each category. The objective of the third round was to build consensus among the respondents by including the frequency ratings for each category as determined by their peers. Respondents were asked to rate the level of importance, again using the original scale. Respondents could repeat their original response or change it to reflect the consensus of the group. The data was analyzed using frequencies, percentages, means, standard deviations, and Pearson product-moment correlation coefficients.

Results

The overall response rate for all three surveys was 82.7%. The individual response rates were 81.5% for survey one, 88.9% for survey number two, and 77.8% for survey three.

Respondents to survey one listed over 350 problems and challenges associated with the first years of teaching agriculture which were subsequently grouped into 23 categories (Table 1). The 23 categories formed the content for surveys two and three.

Table 1

Open Ended Responses of Problems and Challenges from Survey One

Category	Responses
Curriculum issues (organizing, scheduling, time, interesting, etc.)	29
Time management	24
Classroom management and student discipline	21
Program budgets and funding	20
FFA issues, knowledge, activities, events, chapter management, etc.	16
Organizing and managing the facility	16
Learning the structures, policies, procedures, norms, etc.	14
Balancing work and personal life, outside activities, etc.	13
Building school and community support for the program	13
Building a relationship with community resources and people	13
Educating and working with administrators	12
Paperwork	10
Identifying, securing, inventorying, up-to-date teaching resources	9
Being technically competent in all areas of agriculture	8
Dealing with individual student needs	8
Dealing with the reputation of the previous teacher	7
Student motivation and feedback	7
Organizational issues	7
Working with other school faculty and staff	6
Developing a local program improvement plan	6
Public relations, image of agriculture and the agriculture program	6
Teaching methods, strategies and lesson planning	6
Student recruitment	6
Working with parents, volunteers and other adult groups	6
Keeping up with technology (computers, etc.)	5
Other issues and items	62

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Table 2 presents the rank order by mean scores of the 23 categories after round two. The categories are ranked from the highest to the lowest on the Likert-type importance scale. Five categories were rated as very important with mean scores of ≥ 3.50. Seventeen of the categories were rated as important with mean scores between 2.50-3.49. The one remaining category of dealing with the reputation of the previous teacher was rated as slightly important with a mean score of 2.43.

Table 2

Mean Scores of Problem and Challenge Categories from Delphi Survey Two

Category	Mean	S.D.
Managing the overall activities of the local FFA chapter.	3.59	.49
Balancing professional and personal responsibilities and maintaining personal motivation and a positive outlook.	3.52	.65
Properly managing your time, completing paper work and meeting required deadlines.	3.51	.54
Building the support of faculty, counselors and administrators within the school system.	3.50	.61
Using proper classroom management strategies and dealing with student discipline problems.	3.50	.74
Recruiting and motivating students in agricultural education.	3.41	.67
Organizing and developing agricultural curriculum including: schedules, time budgets and selecting relevant and interesting material.	3.39	.53
Organizing and managing safe and attractive facilities (classroom, shop, greenhouse, etc.)	3.39	.67
Building support from parents, organizations and adult groups within the community.	3.37	.67
Developing and managing the budget and finances of the agricultural program.	3.37	.60
Developing and implementing a public relations program to promote the agriculture program.	3.27	.67
Keeping technically competent in new agricultural knowledge, skills and computer technology.	3.27	.67
Developing and using a variety of teaching methods, strategies, grading systems and preparation of lesson plans.	3.25	.69
Identifying and building support from resource people and agricultural industry within the community.	3.22	.75
Developing and managing relevant Supervised Agricultural Experience programs for students.	3.20	.68
Adjusting to individual student needs, learning styles and special education students.	3.14	.82
Forming and using an advisory committee to provide guidance to the agricultural program.	3.14	.71

(1=not important, 2=slightly important, 3=important, 4=very important)

Table 2 continued

Category	Mean	S.D.
Learning the structure, policies, procedures and norms within the school system.	3.08	.67
Completing FFA forms and award applications.	3.06	.72
Developing short-term and long-term program improvement plans (decision making).	2.93	.69
Obtaining and inventorying teaching materials, shop tools, and equipment.	2.91	.67
Preparing competent teams for FFA Career Development Events.	2.76	.69
Dealing with the reputation (positive or negative) of the previous agricultural teacher.	2.43	1.00

(1=not important, 2=slightly important, 3=important, 4=very important)

Table 3 presents the rank order by mean scores of the 23 categories after round three. Sixteen of the mean scores increased and seven scores declined. Respondents moved toward consensus and mean scores generally increased. In the third round, eight of the categories were rated as very important with mean scores of ≥ 3.50. Fourteen of the categories were rated as important with mean scores between 2.50-3.49. The one remaining category of dealing with the reputation of the previous teacher was again rated as slightly important with a mean score of 2.35.

The standard deviations (Table 3) indicated that the tendency was a movement toward consensus. Standard deviations tended to decrease around the mean or stay the same from survey two to survey three. Twenty-one of the 23 standard deviations (91%) decreased from survey two to survey three. The responses were found to be very stable from survey two to survey three as indicated by the Pearson product-moment correlation coefficients. Fifteen coefficients were in the very strongly association range and eight were in the substantial association range (Davis, 1971).

Table 3

Mean Scores of Problem and Challenge Categories from Delphi Survey Three

Category	Mean	S.D.	r
Managing the overall activities of the local FFA chapter.	3.85	.35	.54
Building the support of faculty, counselors and administrators within the school system.	3.73	.44	.56
Balancing professional and personal responsibilities and maintaining personal motivation and a positive outlook.	3.71	.55	.56
Recruiting and motivating students in agricultural education.	3.69	.56	.74
Using proper classroom management strategies and dealing with student discipline problems.	3.64	.57	.86
Properly managing your time, completing paper work and meeting required deadlines.	3.59	.49	.84

(1=not important, 2=slightly important, 3=important, 4=very important)

Table 3 (continued)

Category	Mean	S.D.	r
Building support from parents, organizations and adult groups within the community.	3.57	.59	.73
Organizing and managing safe and attractive facilities (classroom, shop, greenhouse, etc.)	3.57	.50	.58
Keeping technically competent in new agricultural knowledge, skills and computer technology.	3.33	.61	.81
Organizing and developing agricultural curriculum including: schedules, time budgets, selecting relevant~interesting material.	3.33	.57	.87
Developing and implementing a public relations program to promote the agriculture program.	3.30	.60	.66
Developing and managing the budget and finances of the agricultural program.	3.30	.51	.78
Identifying and building support from resource people and agricultural industry within the community.	3.29	.67	.89
Adjusting to individual student needs, learning styles and special education students.	3.23	.69	.91
Forming and using an advisory committee to provide guidance to the agricultural program.	3.19	.59	.75
Developing and using a variety of teaching methods, strategies, grading systems and preparation of lesson plans.	3.16	.58	.61
Completing FFA forms and award applications.	3.14	.60	.85
Developing and managing relevant Supervised Agricultural Experience programs for students.	3.14	.52	.72
Learning the structure, policies, procedures and norms within the school system.	2.97	.51	.61
Obtaining and inventorying teaching materials, shop tools, and equipment.	2.90	.53	.78
Developing short-term and long-term program improvement plans (decision making).	2.88	.55	.86
Preparing competent teams for FFA Career Development Events.	2.83	.62	.62
Dealing with the reputation (positive or negative) of the previous agricultural teacher.	2.35	.90	.90

(1=not important, 2=slightly important, 3=important, 4=very important)

The researchers determined that consensus was indicated on an item if at least 60% of the respondents were in agreement. An analysis of the frequencies found that 19 items (83%) met the criteria for agreement. All 19 items were in the important or very important range. Table 4 shows the level of agreement by frequencies from survey three. Table 5 shows those items on which no agreement was reached.

Table 4

Problems and Challenges Agreed Upon from Survey Three by Percent

Category	Not Important	Slightly Important	Important	Very Important
Managing the overall activities of the local FFA chapter.	0.0	0.0	14.3	85.7*
Balancing professional and personal responsibilities and maintaining personal motivation and a positive outlook.	0.0	4.8	19.0	76.2*
Recruiting and motivating students in agricultural education.	0.0	4.8	21.4	73.8*
Building the support of faculty, counselors and administrators within the school system.	0.0	0.0	26.2	73.8*
Using proper classroom management strategies and dealing with student discipline problems.	0.0	4.8	26.2	69.0*
Building support from parents, organizations and adult groups within the community.	0.0	4.8	33.3	61.9*
Properly managing your time, completing paper work and meeting required deadlines.	0.0	0.0	40.5	60.0*
Developing and managing the budget and finances of the agricultural program.	0.0	2.4	64.3*	33.3
Forming and using an advisory committee to provide guidance to the agricultural program.	0.0	9.5	61.9*	28.6
Completing FFA forms and award applications.	0.0	11.9	61.9*	26.2
Developing and using a variety of teaching methods, strategies, grading systems and preparation of lesson plans.	2.4	2.4	71.4*	23.8
Developing and managing relevant SAE programs for students.	0.0	7.1	71.4*	21.4
Learning the structure, policies, procedures and norms within the school system.	0.0	14.3	73.8*	11.9
Preparing competent teams for FFA Career Development Events.	0.0	28.6	60.0*	11.9
Obtaining and inventorying teaching materials, shop tools, and equipment.	0.0	19.0	71.4*	9.5
Dealing with the reputation of the previous agricultural teacher.	0.0	9.5	64.3*	7.1
Developing short-term and long-term program improvement plans.	2.4	14.3	76.2*	7.1

*%≥60%

Table 5

Problems and Challenges Not Agreed Upon from Survey Three by Percent

Category	Not Important	Slightly Important	Important	Very Important
Organizing and managing safe and attractive facilities.	0.0	0.0	42.9	57.1
Identifying and building support from resource people and agricultural industry within the community.	0.0	12.2	46.3	41.5
Keeping technically competent in new agricultural knowledge, skills and computer technology.	0.0	7.1	52.4	40.5
Developing and implementing a public relations program.	0.0	7.1	54.8	38.1
Adjusting to individual student needs, learning styles and special education.	0.0	14.3	47.6	38.1
Organizing and developing agricultural curriculum including: schedules, time budgets and selecting relevant and interesting material.	0.0	4.8	57.1	38.1

Conclusions

A list of 23 problems and challenges associated with the first years of teaching agriculture was created by the respondents using the Delphi technique. After round two the 23 categories were ranked based on mean scores. The top five categories rated very important were: 1) managing the overall activities of the local FFA chapter, 2) balancing professional and personal responsibilities and maintaining personal motivation and a positive outlook, 3) properly managing your time, completing paper work and meeting required deadlines, 4) building the support of faculty, counselors and administrators within the school system, and 5) using proper classroom management strategies and dealing with student discipline problems. Three of the five problems were related to time management.

Consensus was reached on seventeen categories of problems and challenges associated with the first years of teaching agriculture. Ten categories were rated as important and seven were rated in the very important range. The top seven categories had mean scores ≥ 3.50 and percentages greater than 60% in the very important range. The seven categories were: 1) managing the overall activities of the local FFA chapter, 2) balancing professional and personal responsibilities and maintaining personal motivation and a positive outlook, 3) building the support of faculty, counselors and administrators within the school system, 4) recruiting and motivating students in agricultural education, 5) using proper classroom management strategies and dealing with student discipline problems, 6) building support from parents, organizations and adult groups within the community, and 7) properly managing your time, completing paper work and meeting required deadlines.

Three of the seven categories related to time and organizational management issues and two of the seven categories related to building support for the program. These were problems and challenges which appeared to be different from other research related to the problems and challenges of the first years of teaching agriculture.

Implications and Recommendations

The implications for the profession of agricultural education and specifically teaching high school agriculture is that indeed the beginning years of teaching provide big challenges for the new teacher. The comprehensive nature of a quality program of high school agricultural education, perhaps, makes the tasks expected to be accomplished, more than can be reasonably expected during the first years of teaching. Classroom management and student discipline, again in this study, surfaced as a problem for first year teachers. However, the issues related to time and organizational management surfaced as big problems and challenges. Additionally, managing the activities of the FFA chapter consistently placed at the top of the list in this study. Perhaps the FFA is becoming too big for a beginning teacher to effectively manage. Building support for the program and recruiting and motivating students were also deemed to be very important challenges or problems during the first years of teaching.

As a result of this study it is recommended that:

1. Time and organizational management strategies be incorporated as components of courses and workshops for pre-service and beginning teachers.

2. Ideas for building community, parental, faculty, counselor, and administrator support for the program continue to be important components of courses and inservice workshops for pre-service and beginning teachers.

3. Those involved in providing the leadership for the State and National FFA organizations provide guidelines to new teachers for effectively managing the local FFA chapter during the first years of teaching.

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Problems and Challenges Associated with the First Years of Teaching Agriculture: A Framework for Preservice and Inservice Education

A Critique

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The title of this research project indicated the importance of the endeavor. Any one who has taught high school agriculture remembers the first year very clearly. That year may have been filled with trauma, uncertainty, and a tremendous work load. It has been a quest of many teacher preparation departments to seek methods to ease the pain of the first year of teaching. John Mundt and James Connors efforts provided an illustration of the continued problems of first year teachers. Research such as this study provide meaningful data for construction of new or revision of existing teacher education programs in agricultural education.

A quality element of this study was its links throughout the United States. By utilizing the NVATA Outstanding Young Member Award, the respondents represented all regions of the country. The procedures for the study were well done and it was assumed that the teachers were eager respondents to a subject close to their daily work situations. Therefore, the results were of interest to all teacher preparation departments regardless of their location and student population.

In the conclusions, Mundt and Connors saw a factor not mentioned in the previous and similar research activities. They found that time management was a great concern to first year teachers. This aspect was not outwardly mentioned in the theoretical framework. Others found student-related issues (discipline, motivation) or management issues (student organization or facility planning) as the top concerns of beginning teachers. It appeared that Mundt and Connors conclusions were accurate and met the conditions of the times. If, as Mundt and Connors suggested, beginning teachers were better time managers, then they would be able to better handle their organizational problems and student issues. If teacher could manage their day efficiently, they would have time to plan accordingly and maintain a pro-active attitude to face their student and organizational problems.

Then question, then, for this study's implications, was -- should teacher preparation include time management and how should it be taught? Time management may be an attitudinal aspect of teacher training and can we teach someone to change their attitude? The answer, as suggested by the researchers, was yes. The problem is how to help students make the leap from college time management to teacher time management. These questions should be answered in future studies. The investigation of the time management tactics of successful agriculture teachers is needed as well as a study to determine how teamwork, use of volunteers, and access to community resources would be beneficial to beginning teachers.

A final question raised from this study was a call for investigation of those who leave teaching. Conversationally, professionals in Agricultural Education suggest that many teachers leave teaching during the first through fifth year. A similar study is needed to ascertain why these teachers chose other professions. Are their difficulties related to the difficulties experienced by the best teachers (NVATA winners)? How did the NVATA winners cope when others chose not to cope? Can the NVATA winners become mentors for teachers who are struggling with the problems outlined in this study? The study by Mundt and Connors provided data to help solve the continuing mystery of first year teacher dilemmas. The results, conclusions, and recommendations provided valuable components to teacher preparation in agricultural education.

Student Teachers' Self-Perceived Level of Preparation for Teaching Agricultural Science and Technology

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Introduction

For decades, teacher educators have looked for new and better methods of determining the quality of the academic preparation of agricultural education majors. As teacher education programs struggle to revise course offerings and program requirements, the question remains: are agricultural education majors properly prepared to student teach and assume the duties of an agricultural instructor?

Theoretical Framework

Numerous studies (Rawls & Fatunsin, 1985)(Shippy, 1981) have investigated the competencies needed by agriculture teachers. Additional studies looked at the inservice needs of beginning teachers of agriculture (Mundt, 1989)(Newman & Johnson, 1993). Bowen (1986) found that agriculture teachers lacked knowledge of technical agriculture because of rapidly changing technology.

While much is known about the skills and abilities of beginning agriculture teachers, little research has focused on students completing their preservice education prior to accepting their first teaching position. Some researchers (Byler & Byler, 1984)(Cruickshank & Armaline, 1986), concluded that the most critical part of a teacher education program is the student teaching component. Moss and Borne (1988) concluded that first year teachers perceived their preparation for teaching as acceptable. The respondents felt best prepared for conducting classroom and laboratory instruction. Moss and Borne also stated that university agricultural education courses were an important source of perceived preparedness for beginning agriculture teachers.

Purpose

The purpose of this study was to determine the self-perceived level of preparation of agricultural education majors to student teach and to assume the duties of an agricultural science and technology instructor in a secondary school. The specific objectives of the study were to:

1. Determine student teachers' preparation in program planning, instructional delivery, agricultural mechanics, supervised agricultural experience programs, professional activities, and supervising FFA activities.
2. Determine student teachers' apprehension level towards specific duties of an agricultural science and technology instructor.
3. Determine if differences existed between the student teachers' self-perceived level of preparation prior to, and after, the 10-week student-teaching experience.

Methods

This study was Phase I of a longitudinal study to track student teachers' self-perceived level of preparation for teaching agriculture. A census of all 17 senior student teachers from the University of Idaho and Washington State University constituted the population for this phase of the study. Student teachers were surveyed at the completion of their accelerated courses just prior to starting their student-teaching experience. They were surveyed a second time at the completion of their student-teaching.

This survey used Campbell and Stanley's (1963) one-group pretest-posttest research design (*O-X-O*). The pretest was the completion of the survey prior to student-teaching. In this study, the treatment was the time students spent student-teaching in secondary agriculture programs. The final observation was the completion of the survey at the end of the student-teaching experience.

The survey instrument for this study was developed by the researchers. The survey contained six sections relating to teaching agricultural science and technology which included 89 Likert-type items. The six sections included: planning programs, instruction, agricultural mechanics, SAE programs, professional activities, and FFA. Agricultural mechanics was included in its own section because of the use of the laboratory, safety, skill development and instructional demonstrations. The Likert-type scales ranged from 1=unprepared to 4= very prepared. Section seven included 21 items relating to the student teacher's level of apprehension towards teaching. The ratings ranged from 1=low apprehension to 5=high apprehension. Section eight included demographic questions about the student teachers' background and education.

The survey was checked for content and face validity by a panel of experts in agricultural education from the University of Idaho and Washington State University. Survey reliability was determined post-hoc after the first admission of the survey. Cronbach's alpha reliability coefficients for the seven Likert-type scale sections ranged from .80 to .93.

Results

In each of the six sections relating to teaching competencies the respondents' self-perceived level of preparation increased. However, a close examination of the results showed that selected responsibilities actually decreased after the student-teaching experience.

The Likert-type questions on program planning found that students were somewhat prepared for eight duties and very prepared for three. One duty that decreased was the students ability to differentiate between general and vocational education. Two duties significantly increased during the student-teaching experience. The respondents felt their ability to plan a program to achieve individual educational goals, and their preparation for organizing and using advisory councils improved as a result of student-teaching (Table 1).

Table 1

Planning Programs in Agricultural Science and Technology

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Identify the objectives of vocational education in agriculture.	3.30	.63	3.53	.51	.33
Plan a program in agricultural education to achieve individual educational goals.	2.92	.13	3.38	.14	.02*
Describe basic principles of vocational education.	3.23	.72	3.46	.51	.27

*p<.05. 1=very unprepared, 2=somewhat unprepared, 3=somewhat prepared, 4=very prepared

Table 1 (continued)

Planning Programs in Agricultural Science and Technology

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Differentiate between general and vocational education.	3.84	.37	3.76	.59	.72
Describe the size and scope of vocational education programs in Idaho.	2.76	.59	2.92	.95	.58
Develop long-range plans for an agricultural education program.	2.84	.68	3.00	.57	.58
Plan a comprehensive summer program in agricultural education.	3.15	.80	3.30	.63	.50
Organize and use an advisory committee.	3.07	.75	3.61	.50	.02*
Complete required State Division of Vocational Education reports.	2.25	.75	2.91	.66	.05
Prepare and maintain department records.	2.84	.55	3.07	.64	.38
Develop a departmental budget based upon the instructional program.	2.41	.90	2.91	.66	.16

*p<.05. 1=very unprepared, 2=somewhat unprepared, 3=somewhat prepared, 4=very prepared

Student teachers felt they were somewhat prepared for 27 of the 40 duties related to preparation for instruction. Respondents indicated they felt less prepared after student-teaching for applying interest approaches during a lesson, involving students in the teaching-learning process, the use of leading questions, summarizing a lesson and incorporating plant science instruction into their agriculture program. Two areas showed significant increase after the respondents completed student-teaching. The respondents' use of different methods of teaching and their ability to provide instruction to special-needs, gifted/talented, and handicapped students significantly increased. Table 2 shows the means and results of the paired t-tests.

In the agricultural mechanics area, all nine teaching competencies increased as a result of student-teaching. The respondents felt very prepared for four duties and somewhat prepared for the remaining five teaching duties. There were no significant differences in the respondents' preparation for teaching agricultural mechanics as a result of student-teaching. Table 3 shows the results for the agricultural mechanics items.

Section IV looked at the respondents' preparation for planning and supervising SAE programs in agricultural education. Seven of the eight areas relating to SAEs increased after student-teaching. The respondents felt very prepared for six duties and somewhat prepared for the remaining two. The respondents' ability to instruct students to use the state's SAE computerized recordbook program significantly increased as a result of student-teaching. Table 4 shows the results for the SAE-related duties.

Table 2

Planning for Instruction

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Apply basic principles of learning to teaching agriculture.	3.38	.50	3.53	.51	.54
Designing instructional techniques for students with different learning styles.	2.92	.75	3.38	.50	.13
Apply interest techniques to motivate students.	3.53	.51	3.38	.65	.54
Use various methods to involve students in the teaching ~ learning process.	3.69	.48	3.30	.75	.09
Analyze subject matter in developing units of instruction.	3.07	.49	3.46	.51	.09
Formulate measurable educational objectives for an instructional unit.	3.38	.76	3.69	.48	.10
Use reference and resource materials in instruction.	3.53	.51	3.76	.43	.08
Prepare and use teaching materials and realia in instruction.	3.61	.50	3.76	.43	.43
Recognize student management problems and implement corrective measures.	2.83	.57	3.16	.83	.33
Determine the appropriate time to use various methods of teaching.	2.69	.48	3.15	.37	.02*
Developing instructional materials to meet the needs of the students.	2.91	.66	3.25	.75	.30
Develop and deliver the introduction to a lesson.	3.61	.50	3.69	.48	.58
Use supervised study techniques.	3.15	.68	3.53	.66	.24
Prepare and use lesson plans.	3.61	.65	3.92	.27	.10
Develop daily plans with appropriate time budget.	3.38	.65	3.76	.43	.09
Provide instruction to special needs, gifted/talented and handicapped students.	2.00	.60	3.08	.79	.00*
Prepare a scope and sequence of instruction	2.84	.68	3.07	.17	.38
Prepare materials and equipment for teaching demonstrations.	3.61	.65	3.61	.50	1.00
Conduct effective teaching demonstrations.	3.46	.66	3.69	.48	.33
Evaluate the effectiveness of demonstrations.	3.23	.59	3.46	.66	.27
Use appropriate techniques to stimulate and lead a class discussion.	3.23	.43	3.30	.63	.72
Use leading questions throughout a lesson.	3.46	.51	3.38	.50	.67

*$p<.05$. 1=very unprepared, 2=somewhat unprepared, 3=somewhat prepared, 4=very prepared

Table 2 (continued)

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Summarize a lesson and develop the appropriate conclusion.	3.46	.66	3.30	.63	.43
Plan and organize student activities which reinforce the application of subject matter.	3.38	.50	3.46	.51	.75
Evaluate the effectiveness of teaching.	3.00	.57	3.30	.48	.21
Construct evaluation instruments to assess student achievement.	2.92	.64	3.00	.57	.75
Plan, organize and conduct field trips.	2.83	1.02	3.16	.71	.33
Organize and use student notebooks.	3.07	.86	3.30	.63	.38
Describe fundamental techniques for teaching adults.	2.61	.50	2.61	.76	1.00
Incorporate animal science instruction into your agricultural science and technology program.	3.76	.43	3.84	.37	.58
Incorporate plant science instruction into your program.	3.69	.48	3.61	.65	.58
Incorporate horticulture instruction into your program.	3.23	.72	3.53	.77	.21
Incorporate natural resources instruction into your program.	2.84	.89	3.00	.91	.65
Incorporate agricultural business management instruction into your agricultural program.	3.23	1.01	3.30	.85	.67
Incorporate biotechnology instruction into your agricultural science and technology program.	2.61	.76	2.92	.95	.21
Incorporate aquaculture instruction into your agricultural program.	2.15	.98	2.30	.94	.58
Select and order instructional textbooks.	3.23	.72	3.38	.50	.50
Provide instruction in agricultural literacy.	3.30	.75	3.30	.63	1.00
Provide agricultural instruction to middle school students.	3.00	.60	3.25	.62	.19
Conduct a student recruitment program for your agricultural education program.	3.07	.75	3.38	.65	.10

1=very unprepared, 2=somewhat unprepared, 3=somewhat prepared, 4=very prepared

Section V asked the student teachers about their preparation for completing selected professional activities related to agricultural education. The respondents felt somewhat prepared to assume all seven professional duties. However, three areas showed a decrease after the student-teaching experience. The respondents felt less prepared for working with colleagues, participating in inservice workshops, and completing a Master's degree in an educational related area. One area, preparation for applying for an agricultural teaching position, significantly increased after student-teaching.

The section on supervising FFA activities found that the respondents felt very prepared for 10 of the 14 duties. Students' preparation for 13 of the duties increased after student-teaching. Four items were significantly different as a result of the student-teaching experience. Respondents felt better prepared to perform the duties of an FFA advisor, demonstrating parliamentary procedure skills, preparing members for career development events and leadership events. Table 6 shows the results for the FFA-related duties.

Table 3

Agricultural Mechanics

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Integrate agricultural mechanics into the instructional program in agriculture.	3.38	.76	3.53	.66	.33
List the characteristics of a complete agricultural mechanics program.	3.07	.75	3.30	.75	.38
Plan and organize a curriculum in agricultural mechanics.	3.07	.75	3.53	.66	.05
Plan, organize and maintain physical facilities in a safe and orderly manner.	2.69	.85	3.30	.75	.07
Teach general laboratory safety.	3.46	.51	3.53	.66	.72
Teach the safe operation of power tools.	3.30	.48	3.38	.76	.75
Maintain an inventory of tools, equipment and supplies.	3.38	.76	3.61	.50	.27
Apply principles of color dynamics to improve safety in the agricultural mechanics laboratory.	2.76	.72	2.84	.80	.77
Conduct effective teaching demonstrations related to agricultural mechanics instruction.	3.15	.80	3.46	.66	.21

Section VII (Table 7) asked about the respondents' level of apprehension towards selected teaching responsibilities. Respondents were less apprehensive about 11 of the 21 items after the student-teaching experience. Seven duties resulted in increased levels of apprehension. Respondents were more apprehensive about their competence in the subject matter, how to answer student questions, their lack of clarity, securing a teaching job, dealing with parents, conveying subject matter to students, and grading procedures. One item showed a significant decrease in the apprehension level. Respondents were significantly less apprehensive about their stage fright in front of students as a result of their student-teaching experience.

The Likert-type scale questions were combined into group means for Program Planning, Instruction, Agricultural Mechanics, SAE, Professional Activities, FFA and Apprehension About Teaching. All seven areas increased after student-teaching. Significant increases were found in the FFA, SAE, and Program Planning areas.

Table 4

Supervised Agricultural Experience Programs

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Identify the components of an effective supervised agricultural experience program.	3.46	.66	3.69	.48	.19
Incorporate instruction on planning and conducting SAE programs into your agricultural education curriculum.	3.53	.66	3.69	.48	.16
Supervise students' SAE programs.	3.38	.86	3.84	.37	.05
Conduct SAE visitations.	3.46	.66	3.76	.43	.10
Keep comprehensive records on SAE programs and visitations.	3.15	.68	3.53	.66	.13
Instruct students in keeping accurate SAE record books.	3.23	.83	3.53	.51	.16
Instruct students in using computerized SAE record keeping programs.	2.38	1.04	2.84	.98	.02*
Assist students in preparing SAE projects for show or display at county fairs or other agricultural exhibitions.	3.38	.65	3.30	.85	.72

*$p<.05$. 1=very unprepared, 2=somewhat unprepared, 3=somewhat prepared, 4=very prepared.

Table 5

Professional Activities

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Apply for an agricultural teaching position.	2.76	.72	3.38	.50	.00*
Interview for an agricultural teaching position.	3.00	.57	3.23	.92	.33
Actively participate in professional teaching organizations (IVATA, NVATA, IVA, AVA)	3.00	.57	3.30	.75	.36
Properly balance professional and personal responsibilities.	3.00	.57	3.15	.55	.43
Work closely with school counselors, principal, superintendent and school board members.	3.23	.43	3.07	.64	.43
Actively participate in technical agriculture and instructional methodology inservice educational programs.	3.23	.59	3.15	.68	.72
Advance in the educational profession by completing a Master's degree in an educational related area.	3.30	.85	2.92	.95	.13

*$p<.05$. 1=very unprepared, 2=somewhat unprepared, 3=somewhat prepared, 4=very prepared.

Table 6

Supervising FFA Activities

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Use FFA to motivate students.	3.53	.51	3.69	.48	.33
Identify the characteristics of a successful FFA chapter.	3.76	.43	3.92	.27	.16
Develop a comprehensive FFA Program of Activities.	3.46	.51	3.69	.48	.19
Conduct leadership development activities with FFA chapter officers.	3.46	.66	3.53	.66	.75
Perform the duties of an FFA Advisor.	3.46	.51	3.84	.37	.01*
Demonstrate basic parliamentary procedure.	2.76	.92	3.15	.80	.01*
Prepare FFA members for participation in local, district, state and national career development events.	3.07	.75	3.69	.48	.00*
Prepare FFA members for participation in local, district, state and national leadership events.	3.07	.75	3.53	.51	.02*
Develop and supervise appropriate FFA fund raising activities.	3.15	.55	3.38	.65	.27

*$p<.05$. 1=very unprepared, 2=somewhat unprepared, 3=somewhat prepared, 4=very prepared.

Conclusions and Recommendations

A total program of teacher education in agriculture is a combination of academic courses and experiential education through student-teaching. Student teachers' level of preparation has always been a concern of teacher educators in agriculture. This study found that the student teachers' self-perceived level of preparation was good prior to student-teaching. Specific areas of deficiency were indicated but did not prevent the student teachers from performing well during student-teaching.

Specific teaching responsibilities significantly improved as a result of student-teaching. Student-teaching improved the respondents' ability to achieve individual educational goals, organize advisory councils, use various methods of instruction, and provide instruction to gifted/talented students or handicapped students.

Student teachers felt better prepared to instruct students in using computerized SAE recordkeeping programs, perform the duties of an FFA advisor, demonstrate parliamentary procedure skills, and prepare FFA members for career development events and leadership activities. While the respondents felt better prepared for applying for an agricultural teaching job they were more apprehensive about securing a teaching position after they completed their student-teaching experience.

Overall, the student teachers felt well prepared prior to the beginning of student-teaching. Their student-teaching experience significantly improved their preparation in areas such as program planning, supervising FFA activities and supervised agricultural experience (SAE) programs. These are common areas in which it is extremely hard to create real-life experience for agricultural education majors prior to student-teaching.

The student-teaching experience also helped the student teachers realize areas in which they need additional work. Respondents indicated they realized they needed more preparation in applying interest approaches during teaching, involving students in the teaching-learning process, using leading questions, summarizing a lesson, and incorporating plant science concepts into their instruction.

Table 7

Apprehension Towards Teaching Responsibilities

Teaching Responsibility	Prior to Student-Teaching		After Student-Teaching		Sig.
	Mean	S.D.	Mean	S.D.	
Student discipline	3.15	1.28	2.61	1.19	.32
Problems in motivating students	2.53	.87	2.46	.96	.84
Competence in subject matter	2.15	1.21	2.53	1.33	.39
Competence in answering student questions	2.30	1.03	2.53	1.12	.59
Lack of clarity in class presentations	2.38	.96	2.53	1.19	.78
Securing a teaching job	2.23	1.01	2.76	1.58	.31
Becoming a successful teacher	2.61	.86	2.61	1.26	1.00
Teaching methods and approaches (inadequate)	2.38	.86	2.23	1.01	.70
Obtaining respect from students	2.53	.87	2.46	1.39	.89
Dealing with parents	2.53	1.33	2.69	1.37	.76
Lack of student learning	2.76	1.09	2.23	.83	.13
Administrative approval	2.76	1.16	2.61	1.12	.72
Student attitude toward school	2.61	.76	2.61	1.04	1.00
Conveying subject matter to students	2.23	1.01	2.30	1.10	.86
Inability to communicate with students	2.38	1.04	2.23	1.01	.54
Sensitivity to students needs	2.16	.83	2.08	.99	.83
Grading students	2.00	.91	2.23	1.23	.63
Developing rapport with students	2.38	1.04	2.00	1.15	.42
Developing respect from teacher colleagues	2.15	1.06	2.15	1.34	1.00
Stage fright	2.69	1.03	1.69	1.18	.02*
Eliminating prejudice	2.07	1.03	1.84	1.28	.65

*$p<.05$. 1=low apprehension, 3=moderate apprehension, 5=high apprehension.

The experience of student-teaching in a secondary agricultural education program also helped the respondents overcome their apprehension towards many educationally related responsibilities. The real-world experience of being treated as a teacher and assuming the responsibilities is something that cannot be created in an academic setting. While the respondents felt less apprehensive towards many duties, they felt more apprehensive towards others. The student-teaching experience demonstrate the difficulties of knowing all there is to know about the subject matter, how to respond to students' questions, presenting information in a clear and concise manner, dealing with parents, and deciding on procedures for grading students work. The student-teaching experience significantly helped students overcome their stage fright when presenting lessons to students. While teacher educators constantly try to replicate the experience of teaching during methods courses and micro-teaching laboratories, it will continue to be one aspect of teaching that only becomes real when it is actually experienced in a high school classroom.

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The results of this study should be reviewed by teacher educators in agriculture when reviewing and revising teacher education courses. More emphasis should be placed in the areas of planning for instruction that can truly be replicated in an academic setting. However, student teachers may never realize the importance of many instructional planning duties until they are faced with it on a daily basis during student-teaching. This study should be replicated annually with each year's student teachers to determine trends in the preparation of future teachers of agriculture. The results of the survey can also be used to indicate areas on which more emphasis should be placed. As new areas of agricultural education, such as biotechnology and aquaculture, become common, it will be increasingly more important that agricultural teacher education programs change to meet the ever changing needs of secondary agricultural education students.

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Student Teachers' Self-Perceived Level of Preparation for Teaching Agricultural Science and Technology

A Critique

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The research team is commended for beginning a longitudinal study of teacher preparation. Information gained from the continuation of this study will provide important data for teacher preparation programs. Although the population for this study was a limited group, general information may be gleaned from the results and this information should generate healthy discussion for enhancement of teacher preparation programs.

One limitation of research papers is the restricted publication space. In this paper, it was disappointing to have a restrained theoretical framework. For example, one wonders what teacher competencies were presented in the Rawls and Fatunsin study as well as in the Shippy research project. Because of the brevity, a question was generated concerning inservice needs of beginning teachers. Did other studies only conclude that "agriculture teachers lack knowledge of technical agriculture because of rapidly changing technology?" The theoretical framework did not build a reason for this study. This study was needed. However, the authors did not provide enough theoretical data to compare with the conclusions reached.

It would have been interesting to know how the researchers created their new survey instrument. Were the items selected from past research, current student difficulties, or opinions of an expert panel? Perhaps the teaching responsibilities listed in the questionnaire were drawn from State Department requirements. It would be helpful to readers to understand the origin of the instrument in order to judge whether the conclusions might be useful in their unique settings.

The choice of analysis and a description of the respondents raised a concern. The respondents were describes as a census of all 17 student teachers from two universities. The census "constituted the population for this phase of the study." If, in fact, the researchers considered the respondents a population, why employ an inferential procedure such as a t-test? The use of inferential statistics would be very appropriate if this group was a sample of student teachers from a larger population. Certainly the results of the study do not change because of this interpretation. However, it might be appropriate to use this group of student teachers as a sample of the larger population. Student teachers probably "look the same" from semester to semester.

An indication of a good research subject is found when more questions are raised than answered. This research project was a good one, then, as it provided the reader with many new questions concerning pre-service education. The following suggestions were made to stimulate additional discussion from the results. Since the tables were lengthy and showed a small number of differences, a new table listing the activities with differences from Survey One to Survey Two would allow the reader a convenient illustration.

Categorizing the activities which showed the greatest differences between surveys may allow the research team to view the pre-service program in a new approach. These activities may have some connection (use an advisory committee, planning methods/time, provide instruction to special students, etc.). It would be equally intriguing to illustrate the activities with no change over time (prepare materials, adult techniques, agricultural literacy). An additional illustration may be a ranking of the responses to ascertain where student teachers felt most prepared.

The closing remarks by the research team indicated the true relevance of the study. Sound recommendations were created from the conclusions. However, the researchers stated, "students teachers may never realize the importance of many instructional planning duties until they are faced with it on a daily basis." How, then, can a program successfully prepare future teachers? The answer may lie with the future components of this longitudinal study. Motivation to continue this research is seeking that answer. The research team is encouraged to address the questions from this study in 1, 3, 5, and 10 years; they will build a body of knowledge to enhance teacher preparation.

Concurrent Session C

Theme:
Attitudes and Issues Relating to Agricultural Education

Chairperson:
Alfred Mannebach
University of Connecticut

Discussant:
Joe W. Kotrlik
Louisiana State University

Facilitator:
Kathryn Whitaker
Iowa State University

A Comparison of Attitudes of Students, Parents, and Counselors Toward Agriculture and Agricultural Education
James E. Dyer, Iowa State University
Edward W. Osborne, University of Florida

Comparison of Attitudes Toward Agriculture of Urban High School Students by Agricultural Education Enrollment Status, Minority Status, and Gender
B. Allen Talbert, Purdue University

Ethics in Agricultural Education: Determining Needs and Developing Solutions
Billye Foster, University of Arizona

Impact of Understanding Agriculture: New Directions for Education on Planning in Teacher Education
Carol A. Conroy, Cornell University

A Comparison Of Attitudes Of Students, Parents, And Counselors Toward Agriculture And Agricultural Education

James E. Dyer
Iowa State University

Edward W. Osborne
University of Florida

Introduction and Theoretical Framework

Even though the curriculum of agricultural education has changed intermittently since its inception as a component of secondary education, its one constant is that it has been historically designed for students returning to the farm. As such, it remained practical, applicable, and vocationally oriented throughout most of this century.

Coinciding with decreases in high school agriculture program enrollments, educators and others began questioning the validity of a production-oriented curriculum. The National Research Council (NRC; 1988) characterized the curriculum as "outdated" (p. 3) and in drastic need of overhaul. After careful study of education in agriculture, the NRC found that agricultural education had failed to change with the industry, and that science education had failed to utilize the practical and applicable opportunities agriculture offered. The NRC recommended that more science be incorporated into the agriculture curriculum and that applied science courses in agriculture be available as optional elective science courses, incorporating more agriculture into the curriculum, and providing for more effective teaching of science.

To date, the NRC's report has had a moderate effect on changing the scientific nature of agricultural education. Whereas some states have resisted change, others have become leaders in drafting new curricula which emphasize the scientific nature of agriculture. In states which developed new agriscience curricula, increased support and elevated perceptions of the quality and worth of agricultural education have been reported (Johnson & Newman, 1992; Osborne & Dyer, 1996).

Efforts to highlight the scientific nature of agriculture have also been dramatically increased by colleges of agriculture across the nation as they have sought to boost their enrollments. Administrators traditionally have focused their recruitment efforts on students, parents, and guidance counselors. Thus, the attitudes of each of these groups toward agriculture, and the extent to which they discuss agricultural issues, have the potential to encourage or discourage students in choosing agriculture as a college major or professional pursuit. Perceptions of educational programs in agriculture, at both the secondary and postsecondary levels, may also influence the career advice that these individuals give students.

The fundamental theoretical basis for this study lay in the work of Fishbein and Ajzen (1975). As adapted to this research, this theory suggests that an individual's personal experiences, observations, knowledge, and values about agriculture affect their attitudes about agriculture, which in turn, affect their beliefs, intentions, and decisions to participate or recommend others to participate. Thus, knowledge of attitudes toward agriculture and educational programs in agriculture will, theoretically, provide an indication of an individual's willingness to pursue, or recommend others to pursue, agriculture as a field of study and professional pursuit.

Purpose

The problem addressed by this research is the identification, recruitment, and retention of those students who are most likely to complete a degree in an agricultural area of study and enter agriculture as a career field. The purpose of the study was to determine and compare the attitudes toward the field of agriculture, agricultural technologies, and agricultural and science education programs of those individuals (students, parents, and guidance counselors) who are most influential in helping students form opinions about program selection and career choices (Scofield, 1995). Specifically, the study addressed the following research questions:

1. What were the attitudes of Illinois students, parents, and guidance counselors toward agriculture as a career field and agricultural technologies?
2. What were the attitudes of Illinois students, parents, and guidance counselors toward secondary agriculture and science programs?
3. What was the influence of selected demographic variables on the attitudes and perceptions of Illinois students, parents, and guidance counselors?

Methods and Procedures

This research represents a 3-year longitudinal effort to assess and compare the attitudes and perceptions of students, parents, and guidance counselors. Descriptive survey research designs were used in each study. Target populations included all high school guidance counselors ($\underline{N}$ = 1975) in Illinois during the 1992-93 school year, all high school students in Illinois enrolled in Biological Science Application in Agriculture (BSAA) courses during the 1995 spring semester ($\underline{N}$ = 1140), and parents of those students. The parent population was assumed to equal the student population in that data were to be obtained from one parent of each student in the sample ($\underline{n}$ = 285).

For each phase of the study Krejcie and Morgan's (1970) formula was used to calculate a sample size which would yield a 95% confidence level and a 5% degree of accuracy. Simple random samples were used to collect data from guidance counselors ($\underline{n}$ = 316). To select students and their parents, 20 intact classes were randomly selected from the 76 schools which offered BSAA courses in a cluster sampling technique. Three teachers declined to participate leaving 17 classes with enrollments totaling 384 students.

A five-part questionnaire was developed by the researchers for use in the guidance counselor phase of the study. The questionnaire was reviewed for content validity by an expert panel from the University of Illinois College of Agriculture staff and pilot tested using randomly selected guidance counselors not included in the study. The reliability estimate of the constructs was determined using Cronbach's alpha (range of $\underline{r}$ = .80 - .99).

In the student and parent phases, the instrument was again adapted and mailed to high school agriculture teachers to disseminate to students and parents. Cronbach's alpha estimates of internal consistency (reliability) for the study ranged from .63 to .82 for the student instrument and from .60 to .89 for the parent instrument.

Five-point, Likert-type scales were used to measure guidance counselor, students, and parents attitudes and perceptions. Four mailings in each study produced useable response rates of 208 (65.8%) counselors, 275 (71.6%) students, and 166 (43.2%) parents.

Comparisons of early and late respondents in each phase of the study produced no significant differences on the major constructs of the studies. Therefore, the results of the samples were generalized to the respective target populations as defined above. Measures of central tendency and association, as well as analysis of variance were used to summarize and analyze the data. Post hoc group comparisons were made using the Tukey-B test with a .05 alpha level.

Findings

Male constituents accounted for 51% of the counselors, 63.3% of the students, and 39.2% of the parents who responded. The percentage of students by class was 25 to 30% each for sophomore through senior standing and 13.5% for freshmen.

The mean reported age of guidance counselors was 48.15 years with a mean of 16.52 years as counselors and 8.61 years of teaching experience. Counselors reported the most teaching experience in social studies (23%), followed by English (21%), physical education (14%), business (10%), mathematics (7%), science (6%), vocational education (5%), and elementary education (4%), and other (10%). Nineteen counselors reported no teaching experience. Slightly over 19% of the counselors were familiar with Science in Agriculture Application courses. Approximately 90% of the students and 82% of the parents were at least somewhat familiar with the agricultural industry.

While 30.1% of parents had taken a high school agriculture course, only 13.3% had completed a college agriculture course and 4.8% majored in agriculture in college. About half (52.2%) of the parents reported having paid work experience in agriculture. The largest percentage of parents worked in sales and service occupations (26.5%). Other occupations reported included farmer (8.4%), teacher (7.8%), homemaker (10.2%), finance (12.0%), construction/manufacturing (11.4%), medical (5.4%), public service (4.8%), and truck driver (13.3%). Approximately 50% of the parents reported that they grew up in a rural setting, and over 75% of the students and parents indicated that they now live in a rural setting, with about 50% of each group living on a farm or in a rural area (not in town).

Question 1: What were the attitudes of Illinois students, parents, and guidance counselors toward agriculture as a career field and agricultural technologies?

Students agreed (M = 3.50 - 4.49) with all 10 items comprising the construct "Agriculture as a Career Field." Parents agreed with all items in this construct except "I have encouraged my son/daughter to pursue a vocation or professional pursuit in agriculture." Counselors agreed with 9 of the 12 items comprising this construct. Counselors were uncertain (M = 2.50 - 3.49) about the statements "Males are more likely than females to be interested in agriculture," "The image of agriculture is improving," and "Salaries of university graduates in agriculture are low."

With regard to the nine items comprising the Agricultural Technologies construct, all groups (students, parents, and counselors) agreed with all statements except "Agriculture has greatly contributed to the deterioration of the environment." All groups were uncertain about their attitudes on this item. (See Table 1.)

Table 1
Grand Means and Standard Deviations of Student, Parent, and Counselor Perceptions by Construct

Construct	Students	Range*	Parents	Range*	Counselors	Range*
Ag as a Career Field	4.01	Agree	3.93	Agree	3.93	Agree
	(.51)		(.47)		(.73)	
Ag Technologies	3.83	Agree	3.78	Agree	3.64	Agree
	(.46)		(.42)		(.67)	
H.S. Ag Programs	3.39	Uncertain	3.38	Uncertain	3.22	Uncertain
	(.47)		(.49)		(.75)	
Ag Program Quality	3.70	High	3.78	High	3.44	Average
	(.61)		(.60)		(.84)	
Science Program Quality	3.56	High	3.56	High	4.10	High
	(.59)		(.56)		(.71)	

Note. Standard deviation shown in parentheses. * 1 = strongly disagree or very low and 5 = strongly agree or very high.

Each of the groups expressed similar areas of agreement on the questionnaire. All groups perceived agriculture to be an important industry. Likewise, each group viewed agriculture as scientific in nature, positively impacting the U.S. standard of living, and offering numerous opportunities for employment (Table 2).

Table 2
Most Agreed Upon Statements

	Students		Parents		Counselors	
	M	Rank	*M*	Rank	*M*	Rank
Agriculture is one of Illinois' most important industries.	4.30 (.85)	1	4.23 (.82)	1	4.53 (.65)	1
Agriculture is a scientific area of study.	4.12 (.67)	3	4.05 (.73)	3	4.41 (.58)	5
Agricultural technologies have a positive impact on the U.S. standard of living.	4.07 (.81)	5	4.04 (.77)	5	4.45 (.55)	3
The field of agriculture incorporates many applications of scientific principles.	4.11 (.87)	4	4.01 (.63)	7	4.30 (.55)	10
Sustainable agriculture practices can help protect the environment.	4.02 (.93)	10	3.96 (.87)	10	4.41 (.56)	4
There are numerous opportunities for employment in the field of agriculture.	4.17 (.87)	2	3.98 (.73)	9	4.08 (.86)	16
Agriculture is a blend of scientific principles and agricultural practices.	3.84 (.92)	23	4.10 (.65)	2	4.07 (.48)	17
Agriculture is a constantly changing field of study.	4.03 (.78)	8	4.04 (.72)	4	4.18 (.64)	12
Agriculture should do more to publicize its scientific contributions to society.	3.87 (.90)	18	4.00 (.71)	8	4.47 (.64)	2

Note: Standard deviations are in parentheses.

Statements with which respondents in each study least agreed dealt with limiting access to agriculture programs based upon student background, gender, or geography. The groups were also unified in their disagreement with statements that agriculture contributes to the deterioration of the environment, that agriculture teachers have limited scientific backgrounds, and that students have a positive image of agriculture. Guidance counselors did not believe that most students should complete at least some course work in agriculture, whereas both students and parents agreed with the statement (Table 3).

Question 2: What were the attitudes of Illinois students, parents, and guidance counselors toward secondary agriculture and science programs?

For their agriculture program, students and parents rated the competency of the teacher, ability of students, value and reputation of the program, quality of instruction, and overall program quality as high (M = 3.50 - 4.49). By contrast, ratings of their science programs were slightly lower on some items, including competency of teachers, academic ability of students, and reputation of the science program among students. Students and parents rated their science programs as average (M = 2.50 - 3.49) in these areas and high in the remaining areas (see Table 4). Counselors on the other hand, rated all aspects of science programs as high, but only four of the eight measures of agriculture program quality: teacher competency, work value, quality of instruction, and overall program quality. The remaining measures (college value, academic ability of students, reputation of the program among students, and reputation among faculty) were rated as average.

Table 3
Statements With Least Agreement

	Students		Parents		Counselors	
	M	Rank	*M*	Rank	*M*	Rank
High school agriculture is best suited for males.	2.16 (1.22)	1	2.36 (1.21)	1	2.13 (.82)	1
High school agriculture should primarily be taught in rural communities.	2.68 (1.34)	2	2.68 (1.23)	2	2.39 (.94)	2
Agriculture teachers have limited scientific backgrounds.	2.80 (1.14)	3	2.99 (.99)	5	2.90 (.77)	8
Science Applications in Agriculture are best taught by science teachers.	3.02 (1.09)	4	3.06 (.99)	7	2.87 (.75)	7
High school agriculture curriculum should be more science-based.	3.05 (.97)	5	3.33 (.83)	10	3.63 (.67)	13
Agriculture contributes to the deterioration of the environment.	3.07 (1.19)	6	2.93 (1.18)	4	2.48 (.96)	3
Students have a positive image of agriculture.	3.13 (1.05)	7	3.02 (1.01)	6	2.56 (.90)	5
High school agriculture is easier than most subjects.	3.43 (1.11)	11	2.89 (.92)	3	2.85 (.84)	6
Most high school students should take some coursework in agriculture.	3.84 (.98)	18	3.63 (.89)	14	2.49 (.92)	4

Note: Standard deviations are in parentheses.

Table 4
Perceptions of Program Quality

	Science Programs			Agriculture Programs		
	Students	Parents	Counselors	Students	Parents	Counselors
	M	*M*	*M*	*M*	*M*	*M*
Competency and preparation of teachers	3.57 (.90)	3.44 (.82)	4.29 (.69)	3.77 (.88)	3.79 (.82)	3.79 (.81)
Academic ability of students	3.40 (.83)	3.39 (.80)	3.88 (.67)	3.54 (.83)	3.63 (.75)	2.94 (.59)
Work value of program	3.54 (.90)	3.56 (.82)	3.53 (.83)	3.72 (.91)	3.75 (.81)	3.86 (.79)
College value of program	3.69 (.91)	3.82 (.76)	4.42 (.66)	3.75 (.96)	3.83 (.84)	3.38 (.96)
Quality of instruction	3.66 (.88)	3.57 (.80)	4.21 (.67)	3.79 (.90)	3.73 (.85)	3.77 (.90)
Reputation of program among faculty and administration	3.51 (.83)	3.61 (.85)	4.21 (.73)	3.61 (.95)	3.73 (.91)	3.28 (.98)
Reputation of program among students	3.38 (.92)	3.44 (.77)	4.11 (.76)	3.51 (.96)	3.64 (.85)	3.00 (.88)
Overall program quality	3.72 (.94)	3.61 (.77)	4.18 (.66)	3.93 (.97)	3.96 (.79)	3.53 (.82)

Note: Standard deviations are in parentheses.

Student and parent responses were very similar on the 18 items pertaining to attitudes toward high school agriculture programs. Both groups disagreed (M = 1.50 - 2.49) that high school agriculture courses are better suited for male students. Students expressed uncertainty about whether agriculture courses are too vocational, rigor of courses, effectiveness of agriculture courses with students of differing ability levels, the need for high school agriculture courses to become more science based, and the preparation of agriculture teachers in science. However, they felt that the BSAA course makes scientific principles more meaningful, represents a good approach to learning science, and should receive lab science credit. They agreed that high school agriculture courses should prepare students for college and employment after high school. They also agreed that most high school students should take some course work in agriculture, college-bound students should be encouraged to enroll in agriculture courses, stronger ties should be made between high school science and agriculture curricula, and application of science in agriculture are best taught by agriculture teachers.

Parents agreed with 9 of the 18 statements regarding high school agriculture programs, with the highest mean score for the item "High school agriculture courses should prepare students for college study in agriculture." Other statements with which they agreed included: most high school students should take agriculture course work, stronger ties should be made between agriculture and science curricula, science applications are best taught by agriculture teachers, courses like BSAA make scientific principles more meaningful and are appropriate for lab science credit, lab instruction in agriculture should be more science based, and basic study in science, followed by applications of science in agriculture, is a good approach for learning science. Parents were uncertain about agriculture teachers' preparation in science, whether agriculture curricula should become more science based, the rigor of agriculture courses and their appropriateness for students with differing achievement levels, whether agriculture courses are too vocationally oriented, if agriculture courses should be primarily offered in rural communities, and whether college-bound students should be encouraged to enroll in high school agriculture courses.

Parents were more critical of science programs than were either students or counselors (Table 4). Parents rated as only "Average" the measures of competency and preparation of science teachers, academic ability of science students, and the reputation of science programs among students. Like the parent group, students rated the reputation of science programs among students as only "Average." By comparison, both parents and students rated the quality of all aspects of agriculture programs as "High." Guidance counselors, however, rated all aspects of science programs as "High," but were more critical of agriculture programs. Counselors rated as "Average" the academic ability of agriculture students, college value of agriculture programs, and the reputation of agriculture programs among faculty, administrators, and students.

Like parents and students, counselors disagreed that high school agriculture courses are better suited for male students. Counselors also disagreed that only students from farm backgrounds should enroll in agriculture classes and pursue agricultural careers, that high school agriculture should only be offered in rural areas, college study in agriculture is easier than in most other subjects, and that every student should take some agriculture course work. Counselors agreed that all high school students should be aware of the impact of agriculture on their daily lives, BSAA courses make science more practical and are appropriate for lab science credit, basic study in science followed by agricultural application is a good way to learn science, stronger ties to science should be made, most students are unaware of the impact of agriculture on their daily lives, and that students can complete an agriculture program and a college preparatory curriculum. Counselors also agreed that high school agriculture courses are beneficial for higher achieving students, good preparation for college, and should be more science oriented.

Counselors were uncertain that high school agriculture is too vocational, agriculture teachers have limited science backgrounds, high school agriculture courses are best suited for lower achievers, college-bound students should be encouraged to enroll in high school agriculture courses, and that students have a positive image of agriculture.

Question 3: What was the influence of selected demographic variables on the attitudes and perceptions of Illinois students, parents, and guidance counselors?

Counselors

Counselors employed in schools that offered instruction in agriculture (n=67) expressed more positive attitudes than did counselors in schools offering no agriculture classes (n=140). In neither type of school did counselors perceive that students had a positive image of agriculture, although it was perceived as being lower in schools without an agriculture program. Counselors who reported they had paid work experience in agriculture (n=56) expressed stronger agreement in the importance of agriculture. Male counselors generally viewed agricultural education as more vocational, whereas female counselors viewed the program as scientific and of higher quality. Counselors from large schools (1,500 or more students) believed agriculture to be a scientific area of study, but perceived students in their schools to have the least positive image of agriculture. Counselors from the smaller schools perceived high school agriculture to be better preparation for college study than did counselors from larger schools. Counselors who had completed either high school (n = 17) or college (n = 10) agriculture courses expressed more positive attitudes toward agricultural education than did their counterparts (n = 187).

Table 5

Summary Data* and Analysis of Variance for Student Attitudes by Antecedent Variable

Variable	n	M	SD	SE
Familiarity with Ag Industry by Ag Program Quality Perceptions				
Very familiar	95	30.86^{A}	4.81	.49
Somewhat familiar	143	29.49^{B}	4.80	.38
Not familiar	27	25.96^{AB}	5.13	.99
(F = 11.65, p<.001)				
Familiarity w/ Ag Industry by Career Field Attitudes				
Very familiar	95	42.20^{A}	4.90	.50
Somewhat familiar	145	39.44^{AB}	4.37	.36
Not familiar	28	36.36^{AB}	6.56	1.24
(F = 18.77, p<.001)				
Familiarity w/ Ag Industry by Ag Technologies Attitudes				
Very familiar	94	35.30^{A}	4.14	.43
Somewhat familiar	146	34.20	3.98	.33
Not familiar	27	32.41^{A}	4.03	.78
(F = 5.77, p<.01)				
Gender by Attitudes Toward Ag as Career Field				
Male	169	39.49^{A}	5.22	.40
Female	97	41.22^{A}	4.86	.50
(F = 7.08, p<.01)				
Class by Attitudes Toward Ag as a Career Field				
Freshman	36	37.89^{AB}	4.67	.78
Sophomore	84	39.46	5.20	.57
Junior	68	41.09^{A}	5.00	.61
Senior	79	40.97^{B}	5.07	.57
(F = 4.14, p<.01)				

Note. Means with the same letter superscript within categories are significantly different. *Summated means and standard deviations.

Students

Analysis of variance results showed that student attitudes toward agriculture as a career field, agricultural technologies, and their agriculture program were significantly greater if they were more familiar with the agricultural industry. In addition, females and upperclassmen were found to have significantly more positive attitudes toward agriculture as a career field than males and underclassmen (Table 5). No significant differences were found between student year in school, gender, and size of community in which they now live and attitudes toward their agriculture program and agricultural technologies.

Parents

Parents who lived on a farm, reported having paid work experience in agriculture, were familiar with the agricultural industry, and completed high school agriculture course work reported more positive attitudes toward agriculture as a career field. Furthermore, parents familiar with the BSAA course rated the quality of their agriculture program significantly higher (see Table 6). No significant differences were found between gender or other antecedent variables and parent attitudes and perceptions.

Table 6

Summary Data* and Analysis of Variance by Parent Attitudes by Antecedent Variable

Variable	n	M	SD	SE
Fam. w/ SAA Courses by Ag Program Perceptions				
Very familiar	6	32.67	6.50	2.65
Somewhat familiar	69	31.07^{A}	4.87	.59
Not familiar	50	28.80^{A}	4.21	.60
(F = 4.17, p<.05)				
Paid Ag Experience by Ag Program Perceptions				
Yes	72	31.48^{A}	4.93	.58
No	51	29.02^{A}	4.39	.62
(F = 6.26, p<.05)				
Familiarity w/ Ag by Ag Program Perceptions				
Very familiar	47	42.15^{A}	3.87	.57
Somewhat familiar	80	38.94^{AB}	4.39	.49
Not familiar	27	35.74^{AB}	4.34	.84
(F = 20.48, p<.001)				
Familiarity w/ SAA by Ag as Career Field Attitudes				
Very familiar	7	38.71	5.71	2.16
Somewhat familiar	89	40.36^{A}	4.57	.49
Not familiar	65	37.83^{A}	4.52	.56
(F = 5.74, p<..01)				
H.S. Ag Course Work by Career Field Attitudes				
Yes	47	40.45^{A}	4.17	.61
No	107	38.72^{A}	4.91	.47
(F = 4.42, p<.05)				
Paid Ag Experience by Ag as Career Field Attitudes				
Yes	82	40.44^{A}	4.70	.52
No	74	38.01^{A}	4.39	.51
(F = 10.43, p<.01)				

Note. Means with the same letter superscript within categories are significantly different. *Summated means and standard deviations.

Conclusions, Recommendations, and Implications

Illinois students, parents, and guidance counselors consider agriculture to be important environmentally, technologically, economically, and scientifically. However, statements dealing with educational aspects were not viewed as favorably. More effort needs to be expended in publicizing the role of education in agriculture.

Counselors consider agricultural education to be only moderately important. Likewise, counselors expressed more favorable attitudes toward science programs. Students and parents, however, reported more favorable attitudes toward agriculture programs than science programs. Given a choice of placing a student in an agriculture course or science course, guidance counselors would likely choose the science course. Parents and students would likely choose the agriculture course. More effort needs to be expended in publicizing the scientific attributes of agricultural education, and in upgrading the quality of high school agriculture programs.

In general, each group expressed attitudes that agriculture programs should become less "vocational" and more scientific. In schools where agriculture curricula emphasize science applications in agriculture, counselors are more positive in their attitudes toward agriculture programs and the field of agriculture. Schools should more fully utilize science applications in agriculture in developing and redesigning agriculture courses.

Whereas a large percentage of students plan to pursue an agricultural career, parents were uncertain as to whether they encourage their son/daughter to pursue a career in agriculture. Likewise, teachers held positive attitudes toward the agricultural industry but were unsure if they would encourage their students to pursue an agricultural career. Further research is needed to determine the basis for these discrepant attitudes. Agricultural educators should increase their efforts to inform parents and other educators about the career opportunities in agriculture.

A large number of female students who have career interests in agriculture are enrolled in the agriculture courses. Further research needs to be conducted to determine if these courses are attracting nontraditional students or if the courses are actually developing these interests in agriculture. Likewise, females enrolled in the agriscience courses and upperclassmen (juniors and seniors) have more positive attitudes toward agriculture as a career field than do males and freshmen. Further research is needed to clarify the influential factors in these attitudinal differences.

Students, parents, and counselors are uncertain about several key dimensions of high school agriculture programs. These include rigor, vocational emphasis, need for more of a science basis, preparation of the agriculture teacher in science, and other areas. Given the curricular transformations that have taken place in Illinois high school agriculture programs during the past five years, agricultural educators need to clearly and continually communicate these changes and their benefits to local citizens, educators, the business community, and other groups. Some clarification of new directions may also need to be done within the profession. In addition, teacher educators and state staff must continue to provide inservice and preservice courses and programs that boost the expertise and confidence of agriculture teachers in science.

Students, parents, and counselors feel that agriculture can help protect the environment and resolve environmental concerns, yet they are uncertain as to whether agriculture has contributed to environmental deterioration. Given their positive attitudes toward agriculture and agricultural technologies, an opportunity exists to incorporate more environmental science as it relates to agriculture in the high school agricultural curriculum.

Students, parents, and counselors who are familiar with the agricultural industry have more positive attitudes toward agriculture as a career field and agricultural technologies. They also believe agriculture programs are of higher quality. Agriculture teachers and university faculty should work with the agricultural industry to develop informational programs aimed at further increasing students and parents' familiarity with the agricultural industry.

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A Comparison of Attitudes of Students, Parents, and Counselors Toward Agriculture and Agricultural Education

A Critique

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The authors are commended for conducting a study of attitudes held toward agriculture and agricultural education by stakeholders. These individuals are very important in terms of support for and continuation of agricultural education programs. The authors did a limited but good job of laying the theoretical base and it was well organized. The authors do need to correct the assertion in the theoretical framework that agricultural education began questioning the validity of production-oriented curricula as a result of the National Research Council study in 1988. This assertion clearly ignores the major shift toward non-production-oriented curricula that occurred in most states as a result of the Vocational Education Act of 1963.

The first paragraph talked about traditional curricula being "practical, applicable, and vocationally oriented," while the rest of the theoretical framework talked about incorporating science related concepts into agricultural education and incorporating more agricultural content into science curricula. Nothing in modern curriculum theory discourages or prevents agricultural education curricula from being "practical, applicable, and vocationally oriented." In fact, I am currently conducting the second of two National Science Foundation/Louisiana Board of Regents funded projects that were designed to teach science teachers how to restructure their curricula so that it will be practical, applicable, and career oriented (very similar to the agricultural education tradition!). Modern theory merely stresses the need to strengthen the academic content of agricultural education curricula.

The study was well designed and the authors did a good job of controlling the numerous sources of error. Participant selection, instrument development, and data analyses were conducted and described appropriately. The only concern that exists is with the comparison of early and late respondents to determine if the data collected represents the three populations studied. Although this approach is better than ignoring this issue, it is inferior to conducting a quality follow of non-respondents. A follow-up of non-respondents using an alternative data collection method such as phone interviews should have been used in this study since the data collection procedures yielded response rates ranging from a low of 43% to a high of 71% after four mailings. In the absence of a stronger non-respondent data collection and analysis effort, one may question whether the results can be inferred to the population.

The presentation of the results of the study was very well organized and could be used as a model by any researcher. The authors are commended for presenting the results in a complete, succinct, well organized, very understandable manner in the limited space available. Three errors in Table 5 should be corrected. The description of the first three analyses reported should be reversed. E.g., it appears that the authors analyzed the "ag program quality perceptions by familiarity with ag. industry", not the "familiarity with ag. industry by ag program quality perceptions." The same is true for the next two analyses.

The conclusions and recommendations are clearly and appropriately based on the objectives and findings of the study.

Comparison Of Attitudes Toward Agriculture Of Urban High School Students By Agricultural Education Enrollment Status, Minority Status, And Gender

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Introduction

In 1988, the National Research Council in Understanding Agriculture: New Directions for Education proposed establishing urban "magnet" schools for the agricultural sciences. These schools would serve to attract more urban, minority, and non-traditional students into agricultural education. In 1991, The Strategic Agricultural Education Plan for the State of Indiana proposed that local school districts should establish magnet schools which would facilitate food, agricultural, and natural resource education. From this strategic plan, the STAR (Science and Technology of Agriculture and its Resources) Academy was established as an urban agricultural magnet school within the Indianapolis Public Schools system. The STAR Academy began in the 1994-1995 school year with a freshman class of 54 students and one agricultural science and business teacher (J. L. Peters, personal communication, October 1, 1996).

In a benchmark survey, Mallory and Sommer (1986) found that high school students in California thought that agriculture offered a limited number of career opportunities which were low-paying, hard work, with little career stability. Nichols, Jimmerson, and Nelson (1993) found that Hispanic high school agricultural education students saw a greater barrier to higher education and had more negative perceptions of agriculture than non-Hispanic students. Talbert (1996) found that for urban, freshman, agricultural magnet school students minority status, gender, and socio-economic status were not significant for enrollment constructs, barriers to enrollment constructs, and attitudes toward agriculture constructs. Sutphin and Newsom-Stewart (1995) and White, Stewart, and Linhardt (1991) also found that minority status and gender were not significant for enrollment decision factors. Luft and Giese (1991) in their study and from the literature found that the agriculture teacher had an influence on how students perceived agriculture and whether they enrolled in agriculture courses. Wardlow, Graham, and Scott (1995) in a qualitative study conducted in a rural community in Arkansas concluded that minority agricultural professionals believed that exposure to careers in high school influenced students' career decisions and that role models of the same ethnicity can also have an influence. One interesting conclusion of this study was that the professionals believed that younger students tended to follow the same academic and career paths as older peers. If this holds true in urban settings, then agricultural magnet schools can be a pipeline for minority agriculture teachers and minority agricultural professionals.

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Theoretical Framework

The theoretical framework is based on the career decision-making models from sociology and psychology. From these models we have a base for explaining why people choose to enroll or not enroll in a specific activity such as secondary agricultural education courses. These models also provide a rationale for utilizing ethnicity as a variable and for targeting adolescents as the population.

People make decisions, including enrollment decisions, based on self characteristics and environmental factors (Herr & Cramer, 1992). Herr and Cramer (1992) summarized the Social Learning Theory of Krumbotz and his associates into four areas: genetic endowment and special abilities, environmental conditions and events, learning experiences, and task approach skills. Ethnicity is a consideration under the genetic endowment and special abilities area; therefore, ethnicity theoretically plays a role in decision-making. Lipsett (1962) stated that people make choices partially based on the factors of social class membership, home influences, school, community, pressure groups, and role perceptions. Each of these influence the decision to join or not join an activity, group, course of study, or occupation.

Crites (1969) summarized the psychological approaches to career decision making by stating that people make decisions because of motivation or personality variables. Career development can be divided into life stages and substages (Super, Crites, Hummel, Moser, Overstreet, & Warnath, 1957). In the tentative substage of the exploration stage, ages 15 to 24, adolescents examine career possibilities through fantasy, school classes, and part-time work. Super (1957) concluded that youth perform self-exploration as a result of the environment and situations in the home. He discussed the school as a place that allows for formal exploration of careers through courses, clubs and organizations, and other activities.

Purpose and Objectives

The purpose of this research was to assess the perceptions toward agriculture of students in an urban agricultural magnet school. The specific objectives of the study were to:

1. Describe selected demographic and situational characteristics of students enrolled in an urban agricultural magnet school.

2. Compare these students using the above characteristics on reasons for enrolling, perceived barriers to enrolling, and personal opinions toward agriculture.

Procedures

The population of this study consisted of all freshman and sophomore agricultural science and business students in an urban magnet school in a Midwestern state during the Spring Semester, 1996. There were 50 first year students and 53 second year students. Because the population was so small, a census study was conducted. Enough surveys for all 103 students were mailed to the agriculture teacher with instructions on administering the survey. All surveys were administered and collected on the same day. Because of absences and some students self-selecting not to participate, the response rate was 74% for first year students and 72% for second year students. Students who were absent and who self-selected not to participate may be different than students who participated. However, university human subjects approval procedures did not allow for sampling of non-respondents under these circumstances.

Students were surveyed using a four-part questionnaire previously used in studies identifying factors influencing minority and nonminority students to enroll in agriculture courses (Talbert & Larke, 1993). Part one consisted of 11 demographic items. Part two, 26 items with a five point Likert-type scale, was designed to discover factors influencing enrollment decisions and used the stem "I would enroll in an agriscience course because..." Part three, 18 items with a five point Likert-type scale, was designed to discover factors which were barriers to enrollment and used the stem "For me, enrolling in an agriscience course is or would be difficult because..." Part four, 17 items with a five point Likert-type scale, was designed to discover perceptions that students held towards agriculture. The original instrument had been pilot tested and reviewed for clarity and content validity. From the items in Parts two through four, Talbert and Larke, using factor analysis and Cronbach's coefficient alpha, developed scales to measure attitudinal and enrollment constructs. There were eleven scales with a range of Cronbach's alphas from .67 to .86 and with three to 12 items per scale. The scales were grouped into the construct areas of reasons for enrolling, barriers to enrolling, and personal opinions toward agriculture. Students answered individual items using the Likert-type scale 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Therefore, the higher the scale score the greater the student perceived that particular scale as a reason for enrolling, a barrier to enrolling, or more strongly agreed with the personal opinions scale.

The reasons for enrolling scales were called Agriculture, Influential Persons, Disavowance, and Agricultural Career. The Agriculture scale, 12 items, measured the influence of the agriscience course and agriculture in general on the student's decision to enroll. Most of the items in this scale related to the traditional aspects of agriculture and agricultural education, such as FFA, animals, fairs and shows, and hands-on learning. The Influential Persons scale, six items, measured the influence of family members, friends, and school personnel on the decision to enroll. The Disavowance scale, four items, measured the influence on the enrollment decision of those things that the student perceived as out of his/her control such as the counselor placed the student in the course. The Agricultural Career scale, three items, measured the effect of vocational aspects of agricultural education on the enrollment decision.

The barriers to enrolling scales were called Personal Negative, Teacher Negative, Course Negative, and Agriculture Negative. The Personal Negative scale, five items, involved negative interaction with students or influential persons. These items addressed such issues as not being like other students in class, having negative experiences with other students, and receiving peer pressure not to enroll. The Teacher Negative scale, four items, involved negative interactions with the agriculture teacher. This scale contained items such as teacher discrimination, the teacher not being like the student, and the teacher being indifferent. The Course Negative scale, four items, measured the degree of incompatibility between the student and perceived qualities of the course. This scale included items about the FFA, course difficulty, and career preparation. The Agriculture Negative scale, five items, measured the negative perceptions of the student toward the field of agriculture. These items were related to the status, pay, and physical demands of agriculture.

The personal opinions toward agriculture scales were called Personal Career, Agricultural Occupations, and Occupational Requirements. The Personal Career scale, five items, measured the student's attitudes toward his/her entering an agricultural career. This scale contained items such as wanting to manage an agribusiness, owning a farm, and seeing oneself as capable of getting a good job in agriculture. The Agricultural Occupations scale, seven items, measured the student's perceptions regarding the variety and scope of the agriculture industry. These items related to parts of agriculture besides livestock and crop production such as natural resources, horticulture and landscaping, and agribusiness. The Occupational Requirements scale, five items, measured the student's perceptions regarding the requirements needed to obtain a career in agriculture. This scale included items related to the level of training, basic skills, education, and expertise needed for an occupation in agriculture.

The data were analyzed using SPSS for Windows on an IBM-compatible desktop computer. Frequencies and percentages are reported for Objective One. For objective Two, frequencies, means, and standard deviations are reported. For purposes of interpretation, the following conventions were used when describing means for the scales. Means of 4.5 to 5.0 were described as strongly agree, 3.5 to 4.499 as agree, 2.5 to 3.499 as neutral, 1.5 to 2.499 as disagree, and 1.0 to 1.499 as strongly disagree.

Results

Table 1 shows the demographic characteristics of the population displayed by year of enrollment. Students were classified as minority if they considered themselves to be Black, Native American, Asian-American, or Hispanic and classified as Nonminority if they considered themselves to be White. There were 12 (32.4%) freshman minority students and 16 (42.1%) sophomore minority students. Of the students classified as minority, 26 considered themselves Black, one as Asian American and one as Native American. Almost 60% of both classes were female. Almost all of the students were from an urban area or city of more than 50,000 population. For this study, it was assumed that students who received free or reduced lunch had parents or guardians with lower incomes and lower socio-economic status (SES) than students who did not receive free or reduced lunch. Slightly more than 50% of all students received free or reduced lunch. Greater than 80 percent of the students had no 4-H experience. One-fourth of the freshmen planned to enter an agricultural career upon high school or college graduation and close to one-third planned to enter such a career within their working career. Greater than 40% of the sophomores planned to enter an agricultural career upon high school or college graduation and a majority planned to enter such a career within their working career.

Tables 2 through 4 show the means, standard deviations, and ranges for selected demographic variables with the scales. Table 2 shows the scales by enrollment status. Both groups were neutral that the construct represented by the Agriculture scale was a reason for enrolling in an agriculture class. Freshmen ranged from strongly disagree to strongly agree, while sophomores ranged from disagree to strongly agree. Both groups agreed that the construct represented by the Agricultural Career scale was a reason for enrolling in an agriculture class. Freshmen ranged from strongly disagree to strongly agree, whereas sophomores ranged from neutral to strongly agree. Both groups were neutral that the Disavowance construct was a reason for enrolling. However, the range for both groups went from strongly disagree to strongly agree. The freshman group disagreed that Influential Persons were a reason for enrolling while the sophomore group were neutral. The range for Influential Persons for both groups was strongly disagree to agree. For all four scales the sophomores had higher means than the freshmen.

Also reported in Table 2, for all of the barriers scales, both the freshman and sophomore groups disagreed that these were barriers to enrollment in an agriculture class. For freshmen the highest mean (2.44) was for the Course Negative and Personal Negative scales and the lowest mean (2.16) was for the Teacher Negative scale. For sophomores the highest mean (2.34) was for the Course Negative scale and the lowest mean (1.91) was for the Teacher Negative scale. For all four scales, sophomores had lower means (indicating less perceived barriers) than freshmen. For all four scales, sophomores ranged from strongly disagree to strongly agree that these constructs were barriers to enrolling. The range for freshmen was from strongly disagree to strongly agree for Personal Negative and Teacher Negative and from strongly disagree to agree for Course Negative and Agriculture Negative.

Also reported in Table 2, for all of the Personal Opinions scales both freshman and sophomore groups agreed with the constructs. The Agricultural Occupations scale had the highest mean for both groups. For the Agricultural Occupations and Occupational Requirements scales the range for both groups was from neutral to strongly agree. For the Personal Career scale, freshmen ranged from disagree to strongly agree, while sophomores ranged from neutral to strongly agree.

Table 1

Demographic Characteristics

	First Year		Second Year	
Characteristic n [a]	%	n [a]	%	
Ethnicity				
Minority	12	32.4	16	42.1
Nonminority	22	59.5	21	55.3
Did not answer	3	8.1	1	2.6
Gender				
Female	22	59.5	22	57.9
Male	15	40.5	16	42.1
Location Where Live				
Farm	0	0.0	1	2.6
Rural	1	2.7	1	2.6
Suburb	4	10.8	2	5.3
City	31	83.8	34	89.5
Did not answer	1	2.7		-
Receive Free/Reduced Lunch				
Yes	20	54.1	20	52.6
No	17	45.9	18	47.4
Membership in 4-H				
Yes	4	10.8	5	13.2
No	31	83.8	31	81.6
Did not answer	2	5.4	2	5.2
Immediate Ag Career Plans				
Yes [b]	10	27.1	17	43.7
No	16	43.2	8	22.1
Unsure	11	29.7	13	34.2
Lifetime Ag Career Plans				
Yes [b]	13	35.1	20	52.6
No	14	37.8	7	18.5
Unsure	10	27.1	11	28.9

[a] n = those respondents who answered that item

[b] The categories of Probably Yes and Definitely Yes and the categories of Probably No and Definitely No were combined for reporting purposes in this table.

Table 2

Reasons for Enrolling, Barriers to Enrolling, and Personal Opinions Toward Agriculture Scales by Class

	Freshman				Sophomore			
Scale	n[a]	mean[b]	s.d.	range	n[a]	mean[b]	s.d.	range
Agriculture	33	3.19	.82	1.17-4.58	33	3.43	.65	1.83-4.75
Agricultural Career	37	3.74	1.13	1.00-5.00	37	4.07	.78	2.67-5.00
Disavowance	36	2.57	.84	1.00-4.50	36	2.69	.87	1.25-4.75
Influential Persons	36	2.13	.86	1.00-4.33	37	2.55	.90	1.00-4.00
Course Negative	36	2.44	.82	1.00-4.00	37	2.34	1.05	1.00-5.00
Personal Negative	37	2.44	.99	1.00-5.00	36	2.11	.93	1.00-5.00
Agriculture Negative	37	2.19	.77	1.00-4.20	36	2.04	.87	1.00-5.00
Teacher Negative	37	2.16	.94	1.00-5.00	37	1.91	1.05	1.00-5.00
Ag. Occupations	37	4.29	.62	2.57-5.00	35	4.24	.52	3.14-5.00
Occupational Req.	36	3.78	.65	2.60-5.00	36	3.66	.62	2.60-5.00
Personal Career	36	3.67	.73	2.20-4.80	35	3.92	.57	2.80-5.00

[a] n = those respondents who answered all items comprising the scale

[b] 1.0 - 1.499 = strongly disagree, 1.5 - 2.499 = disagree, 2.5 - 3.499 = neutral, 3.5 - 4.499 = agree, and 4.5 - 5.0 = strongly agree

Table 3 shows the scales by minority status. Both groups were neutral that the Agriculture scale was a reason for enrolling in an agriculture class. Minority students ranged from strongly disagree to agree, while Nonminority students ranged from disagree to strongly agree. Both groups agreed that the construct represented by the Agricultural Career scale was a reason for enrolling in an agriculture class. Minority students ranged from disagree to strongly agree, whereas Nonminority students ranged from strongly disagree to strongly agree. Both groups were neutral that the Disavowance construct was a reason for enrolling. However, the range for Minority students went from strongly disagree to agree and the range for Nonminority students was strongly disagree to strongly agree. Both group disagreed that Influential Persons were a reason for enrolling. The range for Influential Persons for both groups was strongly disagree to agree.

Also in Table 3, for all of the barriers scales both Minority and Nonminority students disagreed that these were barriers to enrollment in an agriculture class. For Minority students the highest mean (2.28) was for the Personal Negative scales and the lowest mean (1.85) was for the Teacher Negative scale. For Nonminority students the highest mean (2.49) was for the Course Negative scale and the lowest mean (2.06) was for the Teacher Negative scale. For all four scales, Nonminority students ranged from strongly disagree to strongly agree that these constructs were barriers to enrolling. The range for Minority students was from strongly disagree to strongly agree for Personal Negative and Teacher Negative and from strongly disagree to agree for Course Negative and Agriculture Negative.

Also reported in Table 3, for all of the Personal Opinions scales both Minority and Nonminority students agreed with the constructs. The Agricultural Occupations scale had the highest mean for both groups. For the Agricultural Occupations and Occupational Requirements scales the range for both groups was from neutral to strongly agree. For the Personal Career scale, Minority students ranged from neutral to strongly agree, while Nonminority students ranged from disagree to strongly agree.

Table 3

Reasons for Enrolling, Barriers to Enrolling, and Personal Opinions Toward Agriculture Scales by Minority Status

	Minority				Nonminority			
Scale	n[a]	mean[b]	s.d.	range	n[a]	mean[b]	s.d.	range
Agriculture	25	3.42	.74	1.17-4.42	38	3.27	.71	1.83-4.75
Agricultural Career	27	4.20	.94	2.00-5.00	43	3.78	.96	1.00-5.00
Disavowance	25	2.58	.88	1.25-4.25	43	2.69	.87	1.00-4.75
Influential Persons	27	2.44	.99	1.00-4.33	42	2.27	.84	1.00-4.00
Course Negative	26	2.18	.94	1.00-3.50	43	2.49	.91	1.00-5.00
Personal Negative	26	2.28	1.03	1.00-5.00	43	2.24	.94	1.00-5.00
Agriculture Negative	26	1.98	.90	1.00-3.80	43	2.18	.77	1.00-5.00
Teacher Negative	27	1.85	.94	1.00-5.00	43	2.06	.97	1.00-5.00
Ag. Occupations	26	4.22	.61	2.71-5.00	42	4.29	.52	2.57-5.00
Occupational Req.	26	3.74	.72	2.60-5.00	42	3.75	.58	2.80-5.00
Personal Career	26	3.85	.61	3.00-4.80	42	3.80	.68	2.20-5.00

[a] n = those respondents who answered all items comprising the scale

[b] 1.0 - 1.499 = strongly disagree, 1.5 - 2.499 = disagree, 2.5 - 3.499 = neutral, 3.5 - 4.499 = agree, and 4.5 - 5.0 = strongly agree

Table 4 shows the scales by gender. Both groups were neutral that the Agriculture scale was a reason for enrolling in an agriculture class. Males ranged from strongly disagree to strongly agree, while females ranged from disagree to strongly agree. Both groups agreed that the construct represented by the Agricultural Career scale was a reason for enrolling in an agriculture class. Males ranged from strongly disagree to strongly agree, whereas females ranged from disagree to strongly agree. Both groups were neutral that the Disavowance construct was a reason for enrolling. However, the range for both groups went from strongly disagree to strongly agree. Both groups disagreed that Influential Persons were a reason for enrolling. The range for Influential Persons for both groups was strongly disagree to agree.

Also reported in Table 4, for all of the barriers scales, females disagreed that these were barriers to enrollment in an agriculture class. Males were neutral that the Course Negative and Personal Negative scales were barriers to enrollment in an agriculture class and disagreed that the Agriculture Negative and Teacher Negative scales were barriers to enrollment in an agriculture class. For males the highest mean (2.62) was for the Course Negative scale and the lowest mean (2.27) was for the Teacher Negative scale. For females the highest mean (2.23) was for the Course Negative scale and the lowest mean (1.85) was for the Teacher Negative scale. For all four scales, females had lower means (indicating less perceived barriers) than males. For all four scales, males ranged from strongly disagree to strongly agree that these constructs were barriers to enrolling. The range for females was from strongly disagree to agree for Course Negative, Personal Negative, and Teacher Negative and from strongly disagree to neutral for Agriculture Negative.

In Table 4, for all of the Personal Opinions scales both males and females agreed with the constructs. The Agricultural Occupations scale had the highest mean for both groups. For the Agricultural Occupations and Occupational Requirements scales the range for both groups was from neutral to strongly agree. For the Personal Career scale, both groups ranged from disagree to strongly agree.

Table 4

Reasons for Enrolling, Barriers to Enrolling, and Personal Opinions Toward Agriculture Scales by Gender

	Male				Female			
Scale	n[a]	mean[b]	s.d.	range	n[a]	mean[b]	s.d.	range
Agriculture	28	3.15	.91	1.17-4.75	38	3.42	.57	2.08-4.67
Agricultural Career	31	3.76	.98	1.00-5.00	43	4.01	.97	1.67-5.00
Disavowance	31	2.55	.89	1.00-4.75	41	2.70	.83	1.00-4.50
Influential Persons	31	2.35	.98	1.00-4.33	42	2.33	.85	1.00-4.00
Course Negative	31	2.62	.96	1.00-5.00	42	2.23	.90	1.00-4.00
Personal Negative	31	2.59	1.10	1.00-5.00	42	2.05	.80	1.00-4.00
Agriculture Negative	31	2.32	.95	1.00-5.00	42	1.96	.67	1.00-3.40
Teacher Negative	31	2.27	1.19	1.00-5.00	43	1.85	.80	1.00-4.00
Ag. Occupations	30	4.23	.65	2.57-5.00	41	4.28	.51	3.14-5.00
Occupational Req.	30	3.56	.57	2.60-5.00	42	3.83	.66	2.60-5.00
Personal Career	30	3.75	.70	2.20-5.00	41	3.82	.64	2.20-4.80

[a] n = those respondents who answered all items comprising the scale

[b] 1.0 - 1.499 = strongly disagree, 1.5 - 2.499 = disagree, 2.5 - 3.499 = neutral, 3.5 - 4.499 = agree, and 4.5 - 5.0 = strongly agree

Conclusions

The population studied was diverse in gender, ethnicity, and SES, while almost all of the students were from an urban environment with little prior agricultural experience. Despite their non-agricultural backgrounds, one-fourth of the freshmen and two-fifths of the sophomores indicated that they saw themselves in an agricultural career after graduation while one-third of the freshmen and one-half of the sophomores saw themselves in an agricultural career sometime within their lifetime. In both instances a higher percentage of sophomores had agricultural career plans than freshmen.

Freshmen and sophomore students were more likely to enroll because of Agricultural Career reasons than Agriculture, Influential Persons, or Disavowance reasons. Neither group perceived the four barriers constructs as reasons not to enroll in an agriculture class. Freshmen perceived greater barriers than Sophomores. Both groups had favorable perceptions regarding agriculture and had the strongest agreement about the diversity of agricultural occupations.

Both minority and nonminority students were more likely to enroll because of Agricultural Career reasons than Agriculture, influential Persons, or Disavowance reasons. Neither group perceived the four barriers constructs as reasons not to enroll in an agriculture class. The construct of the teacher being a barrier received the lowest mean for both groups. Nonminority students perceived greater barriers than minority students. Both groups had favorable perceptions regarding agriculture and had the strongest agreement about the diversity of agricultural occupations.

Both males and females were more likely to enroll because of Agricultural Career reasons than Agriculture, Influential Persons, or Disavowance reasons. Neither group perceived the four barriers constructs as reasons not to enroll in an agriculture class. Males perceived greater barriers than females. Both groups had favorable perceptions regarding agriculture and had the strongest agreement about the diversity of agricultural occupations.

Recommendations

For students in an urban agricultural magnet school, enrollment decisions seem to be based on the characteristics of the magnet and the careers related to it. Therefore recruitment efforts should emphasize positive agricultural aspects of a program and career potential in agriculture.

Sophomores were more likely to see themselves in an agricultural career than freshmen. If more minority and urban students are to enter careers in agriculture, then high school agricultural education programs must have retention efforts to keep freshmen in the program for multiple years.

Quantitative studies, including this one, have found no difference in minority and nonminority students for enrollment decisions (Talbert, 1996; Sutphin & Newsom-Stewart, 1995; White, Stewart, & Linhardt, 1991) yet minorities continue to be underrepresented in agriculture. In-depth qualitative studies need to be conducted to determine reasons why minority students do not enroll in proportional numbers in agricultural education.

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Comparison of Attitudes Toward Agriculture of Urban High School Students by Agricultural Education Enrollment Status, Minority Status, and Gender

A Critique

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The author is commended for conducting this study of attitudes toward agriculture held by urban high school students. These students represent significant potential enrollment for future agriscience education programs and also represent a substantial portion of the future leadership for the field of agriculture. The authors did an excellent job of introducing the study based on the research literature and in laying the theoretical foundation for the study. This section was well organized. The only concern in this section was with the age of some of the references in the area of career development (e.g., Crites, 1969; Lipsett, 1962; Super, 1957). Each of these should have been documented with more recent works of these and other writers because each of them modified their theory over the span of their careers or others refined and improved on their theories. This is especially critical to this study since those theories either totally ignored or failed to adequately address race and gender in career development.

The procedures section was well organized and provided the information needed to evaluate the research design. Although most of the procedures described were appropriate, the author should have improved the instrument based on his previous research using this instrument. The factor analysis and subsequent calculation of Cronbach alpha coefficients for the scales revealed that one scale had a coefficient of .67 which is not acceptable in this case. Additional items should have been written or the existing items should have been rewritten to improve the internal consistency of this scale and any other scale with low alpha coefficients. At least one scale had 12 items which is also unacceptable; since factor analysis revealed that the 12 items all measured the same construct, the weaker items should have been removed from this scale; it is doubtful that all 12 items contributed significantly to the quality of this study.

The results were interesting and the author did a good job of analyzing the data. There are several concerns with the presentation of data. First, the author chose to lump all minority students together into one group even though black students made up most of the minority group. These students should have been broken out into their own group. Second, scales of practical significance should have been developed for the tables breaking down the scale means by class, minority status, and gender. For example, the author reported that sophomores had lower means than freshmen for the scale "course negative." Since the means for the freshmen and sophomores were 2.44 and 2.34, respectively, with a difference of only .10 with standard deviations ranging from .82 to 1.05, there is no practical significance to this difference. There are more substantial differences for other scales that are lost in the presentation of data. Third, much of the data presented in the tables is also presented in the text. The tables do a good job of presenting the data and only those truly unique findings should be highlighted in the text.

The conclusions section is really a summary of findings. No conclusions were presented in this section, however, the first sentence of each paragraph in the recommendations section was a conclusion.

Ethics And Agricultural Education: Determining Needs And Developing Solutions

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INTRODUCTION

In his introduction to Ethics and Agriculture: An Anthology on Current Issues in World Context, Charles Blatz begins with the following statements:

> AGRICULTURE IS CHANGING AROUND THE WORLD. The most dramatic of these changes threaten the very ability of humanity to produce the food needed to sustain itself. Yes, we are producing more on less land with less human effort, but some of our methods deteriorate the resources to such an extent that the production lives of many important agricultural areas can be numbered, not in centuries, but in decades. (Blatz, 1991, p. 1)

Blatz's introduction provides a unique insight into the justification of this study. Consumers are faced with a changing world, both through technology and public opinion. As the consuming public becomes more interested in techniques used in the production of the food and fiber they demand, the agriculturist becomes more involved in public relations.

The attraction of Arizona's unique climate for so many people, has caused a burgeoning urban community to search for more recreational areas to enjoy. Across the Western United States, as well as the entire nation, recreation and tourism have become major sources of income to both individuals and state governments. Less than two percent of the population is involved in agricultural production. However, 100 percent of the population is involved in the consumption of agricultural products. How then should an acceptable balance between agriculture and consumers be created? Where does such a process begin?

Ethical issues pervade daily operations in all phases of the agricultural industry. Yet ethical issues in agriculture are among the least understood and least taught areas of the curriculum available to all agricultural education students. When addressing the question, "What would we like to have a student of agriculture be prepared to do about social and ethical questions?", Dr. Otto C. Doering responded:

> My goal would be to produce students who are able to recognize and weigh the tradeoffs involved in applying broad social and ethical norms to today's decisions. We cannot avoid responsibility by using the device of throwing our students into international or other cross cultural experiences to sensitize them to "real" issues—they must first be able to identify and deal with the context of their own society. (Agriculture and the undergraduate proceedings, 1992, pg. 239.)

Few, if any areas in agriculture have gone untouched by the debate over ethical issues. Today's statistics reflect fewer numbers of actual agricultural producers and projected technological advances hint of even further reduction in the number of agriculturists directly involved in the production of food and fiber. Agricultural policies reflect more and more the opinions of consumers as opposed to those of actual producers. Ethical questions and issues have evolved in areas encompassing topics ranging from livestock show ring ethics to the use of animals in research laboratories and from control of natural resources and public lands to long-term effects of genetically altered food supplies. As these ethical questions have inundated agricultural professionals, the question for the agriculturist becomes one of responsibility. Because of the ever changing views of an easily swayed and agriculturally illiterate public, agricultural education professionals need to become more and more proficient in the area of communication. According to Olsen and Elliot (1995), portraying an accurate message about agriculture is essential for the future of the country. The art and science of problem solving, long used in agricultural education, has become a focal point and instructional technique area for many agricultural education departments across the country. McCormick describes problem solving as building teaching upon real life problems and then actively involving students in seeking intelligent answers to these problems. This process is designed to teach students how to think, how to reason, and how to make decisions (McCormick, 1994). The challenge, as seen by the researcher, is multi-faceted, combining the identification of areas of need and the skills of problem solving and communication into an effective tool which both educators and students alike can utilize in dealing with ethical issues.

The limited availability of such tools to secondary school agricultural education instructors was further exposed through a Current Research Information System (CRIS), a system supported by the U. S. Department of Agriculture, search done for this study. The search revealed only one study relating to ethics and agricultural education over the past ten years. An expanded search under the topic of ethics and agriculture revealed 38 broader based studies; from which only two continued through to the development of educational materials for secondary schools.

Agriculture is a natural science that touches all contemporary lives. We all eat, wear clothes and enjoy many luxuries provided by the agricultural production industry. However, due to the nature of society, many people are so far removed from production agriculture they have forgotten the true importance of its contribution to humankind. Agricultural educators in the public schools are the logical professionals to help prepare young people to better communicate agricultural information with our ever changing society.

PURPOSE AND OBJECTIVES

This study is the first phase of an overall three phase project to prepare and evaluate curricula addressing the ethics of current agricultural issues to be used by both agricultural and general education classes. Phase one of the project would determine which areas of agricultural ethics are most critical to consumers and educators. Phase two would identify the current curriculum available to teachers and determine prevalent teaching methods being used. Phase three would include the development and piloting of new materials for the classroom.

The primary purpose of this study was to determine which areas of agricultural ethics are perceived by secondary teachers to be most critical to the general consuming public and therefore students of agriculture. This study was limited to the western states.

The objectives of this study were:

1. To determine if secondary teachers of agriculture, science, history, and social studies address ethical issues in their classes.
2. To identify the three most important areas of ethical agricultural issues relevant to consumers as perceived by secondary school teachers in the areas of agricultural education, science, history and social studies from Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.
3. To identify the three most important areas of ethical agricultural issues relevant to the curricula of selected secondary school teachers as perceived by secondary school teachers in the areas of agricultural education, science, history and social studies from Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

METHODS AND PROCEDURES

A stratified proportional sample (relevant to teacher population of each state) of certified secondary school teachers in the areas of agricultural education, science, history and social studies randomly selected from the ten state region constituted the sample population. Due to the wide variation in numbers of teachers in each state identified, the investigator realized a stratified proportional sample would provide a more accurate picture of the region identified.

In order to utilize the most current listing of agricultural education teachers in the identified states, the researcher contacted state supervisors for agricultural education in each state. The supervisors provided their most current directory for teachers in their respective states. Secondary schools offering agricultural education in the selected states totaled 1,030. Two hundred eighty-seven schools were selected. In the first mailing the agricultural education teachers were asked to identify one science teacher, one history teacher and one social studies teacher at their secondary school. As illustrated in Chart 1., California had the most teachers selected and Nevada the least number of teachers.

According to Delbecqu, et al. (1975) thirty well chosen respondents provide sufficient information for a Delphi study. Realizing at least 15 percent of the selected participants would decline, the researcher felt the initial sample would provide an excess of the minimum respondents suggested by Delbecqu.

The Delphi is a group process technique used to elicit, collate and generally direct informed judgment towards a consensus on a particular topic. This technique was modified for use in this study. Initially the expected turn around time for the first mailing was extended to allow the agricultural education teachers to identify the remaining secondary teachers to be contacted at their respective schools. In addition, limited debate among the participants was designed into the questionnaires. Although comments were encouraged, participants were asked to rank items and agree on group rankings. Opinions from four groups of educational professionals (agricultural education, science, history and social studies) were gathered to determine the stated objectives. It should be noted that because of the variation among schools in offering history or social studies, both groups were included. The agricultural education teachers were selected randomly, the science, history and social studies teachers were brought into the study through recommendations from the agricultural education teachers.

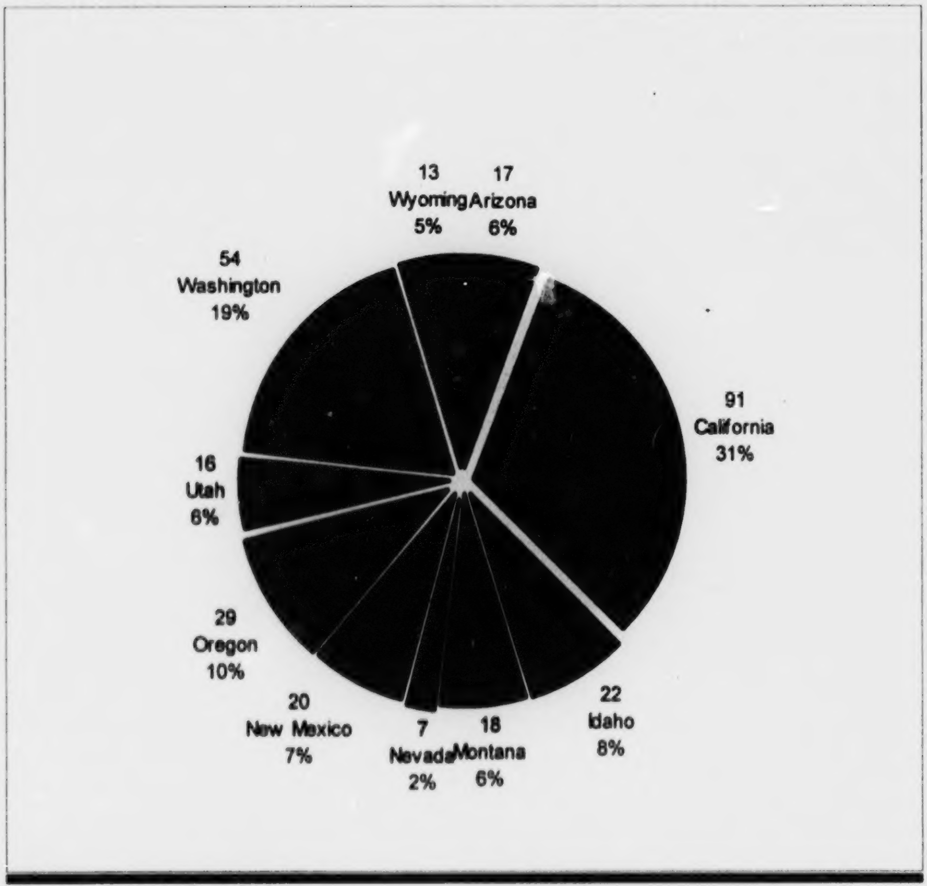

Chart 1. Sample Population

Following the identification of the sample population, an initial questionnaire was developed. Construct validity was determined through a panel of experts including faculty and graduate students in various educational fields.

The first questionnaire was mailed to selected participants. In this round subjects were asked if agriculturally related ethical issues were addressed in their classes. They were also asked if any ethical issues were addressed in their classes. Then participants were asked to rank a group of ten issues according to their importance both in the classroom and as a consumer, in an effort to determine if topics were discussed based on teacher preference or student need. The ten issues used in the first questionnaire were identified in a study by Olsen and Elliot (1995). Those issues were as follows:

a. destruction of natural habitats on privately owned agricultural land
b. public land used for agricultural purposes
c. water rights control
d. chemical pollution of the soil
e. production of animals for research use
f. livestock show ring ethics
g. recreational harvest of wildlife
h. production of animals for food
i. wildlife production for recreational use
j. chemical pollution of water sources.

A section was included to reveal any concerns not listed in the group of ten issues. The first round was actually a two part mailing. The agricultural education teachers were sent the questionnaire and also asked to identify a science, history and social studies teacher from their respective schools. When completed questionnaires were received, identical questionnaires were sent to the science, history and social studies teachers identified by the agricultural education group.

During the second round of the Delphi, subjects were provided with the group consensus order of importance of the ten topics presented in round one. This order was determined by ranking according to majority selections.

In addition they were provided with a list of three additional topics identified by the participants as relevant in round one. Relevant topics were selected according to the topics listed most often. Only three areas were repeatedly listed. Other topics were varied and listed only one time each. Subjects were then asked to identify in order of importance the top six topics from the list of thirteen topics compiled from the original ten plus the three identified additions. Subjects were also provided an open-ended section in which to list arguments on behalf of their selected six topics.

Round three, the final round of the study, provided the three top ranked issues. Representative justification statements were also provided for each issue. Subjects were asked to agree or disagree with the rankings. Participants were also encouraged to include any comments regarding the final selection of issues. Although these comments would have no bearing on the current study, it was felt they would be helpful in phase two of the overall project.

Seven to ten days after each round of the mailings were sent, follow-up phone calls were made and second copies of the questionnaires were faxed or mailed to those individuals requesting them.

RESULTS AND FINDINGS

The primary purpose of this study was to determine which areas of agricultural ethics are perceived to be most critical to the general consuming public and therefore students of agriculture. Because of the great diversity of agricultural enterprises across the country, this study began in the western states and was conducted to identify areas of concern to the subjects identified.

Of the original group of 287 agricultural education teachers surveyed, 41.8 percent (120 schools) returned their round one questionnaires. Due to the fact that some of the responding agricultural education teachers identified less than three additional teachers in the areas of science, history and social studies, the total number of subjects surveyed in round one was 410. Of this total, 49.2 percent (202 teachers)returned their questionnaires.

Round two began with 202 questionnaires mailed to the sample population. A total of 109 were returned for a return rate of 54 percent. One- hundred and nine questionnaires were mailed in the final round. Seventy-five were returned. This represented 68.8 percent return for the final round. Additionally, this recognized that seventy-five (75) participants continued responding throughout the entire study. Almost two-thirds (61.5 percent) of the completers (participants in all three rounds) were agricultural education teachers. Slightly over one-sixth (16.9 percent) of the respondents were science teachers, just over one-fifteenth (6.2 percent) were history teachers, and almost one-seventh (15.4 percent) were social studies teachers.

The returned questionnaires were processed by using the Statistical Package for the Social Sciences (SPSS, 1994), SPSS 6.1 for Windows version. The yes/no questions were analyzed using descriptive statistics and tables of frequency. The lists of issues were analyzed and ranked using tables of frequencies. Finally the open-ended questions were analyzed using comparative listing techniques.

Stage One

Questionnaire number one provided a listing of ten topical issues identified (Olsen and Elliot, 1995), as prevalent concerns to the general consuming public. This questionnaire also contained two yes or no questions and an open-ended section to allow for identification of issues not previously identified. Construct validity was determined through a panel of experts including faculty and graduate students in various educational fields. Reliability was not determined as the questionnaires were developed using simple ranking formats.

The yes or no questions asked if the subjects addressed ethical issues in class and if they addressed agriculturally related ethical issues in class. More than ninety-eight (98.5) percent of the subjects responded they did address ethical issues in the classroom, almost ninety-three (92.9) percent said they addressed agriculturally related issues (Table 1.).

	Address Ethics in Class		Address Ag Related Ethics in Class	
	n	%	n	%
Yes	192	98.5	183	92.9
No	3	1.5	14	7.1

n = total respondents
% = percent response

Table 1. Are ethical issues addressed in class?

As seen in Table 2, subjects were also asked to rank ten identified issues according to their relevance to the individual as a consumer and their relevance to the individual's classroom curriculum.

Additionally, round one included an open-ended section requesting identification of issues not addressed. Three topics emerged from this section. Those topics included: Right to Farm—conversion of agricultural land to urban development; Government land use regulations—grazing rights; Biotechnology—the genetic altering of plant and animal tissue.

Relevance as Consumer		Relevance to Curriculum	
1	Chemical pollution of water sources	1	Chemical pollution of water sources
2	Chemical pollution of the soil	2	Chemical pollution of the soil
3	Water rights control	3	Production of animals for food
4	Public land used for agricultural purposes	4	Water rights control
5	Production of animals for research use	5	Public land used for agricultural purposes
6	Destruction of natural habitats on privately owned agricultural land	6	Destruction of natural habitats on privately owned agricultural land
7	Recreational harvest of wildlife	7	Production of animals for research use
8	Production of animals for food	8	Livestock show ring ethics
9	Wildlife production for recreational use	9	Recreational harvest of wildlife
10	Livestock show ring ethics	10	Wildlife production for recreational use

Table 2. Ranking of Ten Ethically Related Issues

Stage Two

Questionnaire number two, asked participants to rank the top six issues from the combined original list of 10 and the three additional topics in round one. This reducing process was intended to help participants identify the top three issues relevant to Objective 2. Again respondents were asked to select these choices based on their relevance to the respondents as consumers and to their classroom curriculum. Table 3 shows the results of these rankings.

	Relevance to Consumer		Relevance to Curriculum
1	Right to Farm—conversion of agricultural land to urban development	1	Water rights control
2	Water rights control	2	Chemical water pollution
3	Public land used for agricultural purposes	3	Right to Farm—conversion of agricultural land to urban development
4	Government land use regulations—grazing rights	4	Chemical pollution of the soil
5	Chemical pollution of water sources	5	Government land use regulations—grazing rights
6	Chemical pollution of the soil	6	Production of Animals for Food

Table 3. Ranking of Top Six Ethically Related Issues

Stage Three

The final round of the Delphi presented participants with the top three issues in each area of concern (consumer and curriculum), as determined by group consensus. They were also given representative justification comments made about the top three areas. Subjects were asked to agree or disagree with the ranking of the selected issues. Participants were also encouraged to make comments on any of the selected issues that they did not feel were relevant. No outside comments were made. In both areas of relevance, consumer and curriculum, all three of the selected issues were approved. No selected issue received less than 90 percent approval. Table 4. shows the results for each issue.

Relevance to Consumer			
	Right to Farm—conversion of agricultural land to urban development	Water rights control	Public land used for agricultural purposes
agree	90.8 %	96.9%	90.8 %
disagree	9.2 %	3.1 %	6.2 %
no comment	0	0	3.1 %

Relevance to Curriculum			
	Water rights control	Chemical water pollution	Right to Farm—conversion of agricultural land to urban development
agree	95.4 %	98.5 %	90.6 %
disagree	3.1 %	1.5 %	9.4 %
no comment	1.5 %	0	0

Table 4. Acceptance of Consensus Issues

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Two of the three most relevant issues facing agriculturists from both the consumer viewpoint and the curriculum viewpoint were the same. *"Water Rights Control"* and *"Right to Farm"* were considered important when participants considered both areas of relevance. In addition, from a consumer standpoint participants found *"Public land used for agricultural purposes"* to be important. However, when considering the issues from a classroom curriculum view, participants added *"Chemical Water Pollution"* as the third relevant issue. These findings indicate that both land use and public water sources are areas of concern for both consumers and producers. This would also suggest that these issues would be equally at home in either the agricultural education classroom, or a more traditionally academic classroom, such as science, history or social studies.

CONCLUSIONS/RECOMMENDATIONS/IMPLICATIONS

The purpose of this study was to determine which areas of agricultural ethics are perceived to be most critical to the general consuming public and therefore to students of agriculture. The study followed a modified Delphi process combining pre-determined lists with open-ended questions.

Conclusions

Nearly all, (98) percent, of the teachers surveyed reported addressing ethical issues in class. Almost ninety-three (92.9) percent reported addressing agriculturally related issues.

1. All secondary school teachers selected for the study currently teach in Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. Almost two-thirds (61.5 percent) of the completers (participants in all three rounds) were agricultural education teachers. Slightly over one-sixth (16.9 percent) of the respondents were science teachers, just over one-fifteenth (6.2 percent) were history teachers, and almost one-seventh (15.4 percent) were social studies teachers.
2. Consumers are very interested in the areas of agriculturally related ethics regarding land use and water sources. The areas specifically identified included: Right to Farm—conversion of agricultural land to urban development; Water rights control; and Public land used for agricultural purposes.
3. Based on results of the study, teachers often separate their personal views from what they perceive to be relevant to the classroom. Issues identified by the population as relevant to the curriculum included: Water rights control; Chemical water pollution; and Right to farm—conversion of agricultural land to urban development.

Recommendations

Based on results of the study the following recommendations are offered:

1. This study was the initial stage of a three part project. These results suggest that materials should be made available to teachers to address the most often selected issues.
2. Limited information regarding agriculturally related ethical issues in secondary schools would suggest that this study should be replicated in other regions of the country.

Implications

As all people inhabit the same planet, this study has shown that even different educational groups share many of the same concerns. Students and leaders of tomorrow will face many of the same problems. Certainly, if not all ethical issues concerning agriculture are relevant to the classroom, those identified here should be addressed by teachers allowing students to view all sides of the issues and practice problem solving.

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Ethics and Agricultural Education: Determining Needs and Developing Solutions

A Critique

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This is a very interesting and well written study. Perhaps the strongest part of this manuscript was the theoretical base. The theoretical base provided a good foundation for the study and served to highlight the major issues involved. Ethics is certainly a timely topic for agricultural educators given the recent emphasis placed on animal rights, sustainable agriculture, environmental protection, and other major issues. The author is correct in observing that agricultural educators have generally ignored this issue in agricultural education research.

The author did a good job of describing the research procedures used in the study. One concern is the author's claim that the Delphi technique was used. Many studies, including this one, claim that a "modified" Delphi technique was used. However, as in most of these studies, there are so many deviations to the Delphi technique in this study that it is inappropriate to call this a modified Delphi technique. The problems that the author experienced with the return rate and the very substantial imbalance reported in the size of the groups represented in the final response wave are two main reasons why this does not qualify as a Delphi or even a modified Delphi study. No explanation was given as to why teachers from the ten states listed were used, other than they were located in the western U.S.

The author reported return rates based on the number returned as a percentage of the questionnaires mailed on that round. The true overall return rate for this study is 6.5%since a return of 75 out of 1,148 was achieved. The use of percentages based on the number mailed on that round was confusing.

Although the author's design called for an equal number of teachers from the four subject matter areas, almost two-thirds of the final group were agricultural teachers with much small numbers from the other areas. This presents a major face validity problem in this study. Given the purpose of the study, this study would have been improved substantially if a much smaller group and more effective data collection techniques had been utilized.

The conclusions and recommendations section of the manuscript need major improvement. The conclusions in the manuscript were primarily a summary of findings and the recommendations could have been written without conducting this study.

Overall, I enjoyed reading the study and encourage the author to continue research in this area. There is a major void in the area of ethics research in the agricultural education field and this research could make a major contribution to the field in the future.

Impact Of Understanding Agriculture: New Directions For Education On Planning In Teacher Education

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Introduction

The results of the study conducted by the National Academy of Sciences in 1986, which led to Understanding Agriculture: New Directions for Education (NRC, 1988) revealed that the 89 programs in teacher preparation in the U.S. are typically focused on production agriculture. Historically, they have provided instruction in technical agriculture and teaching methodologies and are controlled by mandates issued by their respective state boards of education. Recently, though, greater emphasis has been placed on skills beyond traditional production agriculture such as communication skills, basic science, computers, mathematics, humanities and social sciences, international agriculture systems, problem-based instruction, and technological agriculture. Lee (1985) reported that new teachers felt that the practical and technical parts of their educational preparation were the least useful, a natural consequence of the production agriculture tradition in the secondary schools.

A decline in vocational agriculture teaching jobs paralleled a decline in the number of graduates entering teacher education programs (Camp, 1987). The number of secondary departments that close because of the lack of qualified teachers continues to be a concern. However, there are concerns beyond sheer numbers related to the broader range of interests and teaching skills that are needed if teachers are to plan, deliver, and evaluate instruction as recommended in Understanding Agriculture: New Directions for Education (NRC, 1988). While 46 states and all national agricultural organizations have developed tactical plans and programs to address recommendations resulting from the study (Pope, 1992), it is unclear how comprehensive those plans/programs are, or how much they follow guidelines and goals of the national plan. In addition, the focus has been on change at the secondary level with little attention given to the need for a plan to revise teacher education in agriculture even though there were recommendations for postsecondary education, as well. The traditional role that teacher education programs have played in the organization of secondary agriculture programs at the secondary level is consistent with emerging theories about why some educational reforms do not succeed (Thompson, 1995), namely, that the foundation of agricultural education which includes the historical "production model" for preparation of teachers relies on an industry and clientele that no longer exist.

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Conceptual Framework

Agricultural education programs in the high schools are focused on youth development through instruction and practice in communications, democratic participation, and team and group activities. It is important that these aspects of traditional programs remain intact, but adapted to be more flexible to meet the needs of individual students (NRC, 1988). Changing curriculum materials, renaming courses, and adding career awareness and/or exploration are not enough to redirect agricultural education to meet the needs of the workforce and foster personal development for previously unserved populations. However, those types of changes are important components of a major restructuring effort that must also include changes in how teachers are prepared. In addition to curriculum and other changes, the philosophy of delivery must also be changed to better reflect the agricultural industry of today and the communities in which it is a viable part of the social and economic fabric.

A national movement is underway at this time to grant science credit for agriculture courses at the secondary level. In a recent study most Arkansas agriculture teachers believed that this would have positive impact on both students and their programs, mainly in the area of enhancing student interest in agriculture and the image of the agriculture program (Johnson, 1996). However, they recognized that the scientific content of their curricula must also be strengthened. Johnson (1996) also stated that the primary objective of any science credit for agriculture initiative should be to benefit students by using agriculture as a context through which to increase student interest and achievement in science.

In order for reforms in agricultural education to be successful at the regional and national level, the teacher education programs must be staffed with faculty prepared to be teacher educators in agricultural science. While much of the emphasis in curriculum and materials development over the past few years has been in the area of agricultural science, the approach to pedagogy has remained the same and little, if any, emphasis has been placed on several key areas: 1) enhanced science and mathematics skills, 2) pedagogies for teaching science and mathematics, and 3) processes and procedures of integration of academic and vocational curricula (Gray, 1993). Of no less importance is the fact that research in the field of agricultural education has not expanded to include these key areas. Teacher educators in agricultural science must be prepared to be part of a larger reform effort—not to just replicate standard practices, but to prepare teachers who are themselves agents of change. These teacher educators must not only understand the history and philosophy of vocational education and agricultural education, but must be aware of the needs of the students and the industry of today. The graduate of the certification program in agricultural science program of the future will:

1. be scientifically and technically literate,
2. possess competence in several areas of technical agriculture,
3. be well-grounded in contemporary theories of teaching and learning, and
4. understand and be able to implement the processes of integration of various curricula (NRC, 1988).

Traditional teacher education in agriculture programs focus on several key areas of instruction. These areas of instruction are in keeping with the behaviorist theories of teaching and learning, but also focus on production agriculture, tacitly if not explicitly. Methods courses are weighted heavily toward traditional methods for planning, delivery, and evaluation of vocational agriculture coursework.

The committee responsible for Understanding Agriculture: New Directions for Education (NRC, 1988) expressed concern that vocational agriculture teachers are "still being prepared to teach mainly traditional production agriculture" (p. 45). To stay current, programs must be offered to a broader range of students—teachers of these programs must acquire knowledge and teaching skills related to agribusiness marketing, public policy, economics, finance, science and technology, and international agriculture. There was skepticism expressed in the report that there is an adequate supply of teachers with the range of interests and teaching skills needed in future agriculture courses of the type recommended. Specific recommendations for teacher education outlined in the report included:

1. Teacher education programs in agriculture should continue to stress applied learning, but should strengthen instruction in science, technology, economics, agribusiness marketing and management, international agriculture, and public policy.
2. The federal government and elementary and secondary school teachers involved in teaching agriculture should work to develop, refine, and adopt methods for the transfer of information and knowledge from research to classrooms.
3. Teacher education programs in agriculture should establish formal links with colleges of agriculture and education, cooperative extension, and private-sector organizations to develop new in-service programs and opportunities.
4. Colleges of agriculture should become more involved in curriculum reform, creation of new materials and courses, and inservice education programs. One way to do this would be the creation of new linkages between agricultural education administrators and faculty within colleges of agriculture and education. Each state should examine the feasibility of developing a center for curriculum design and teacher, administrators and counselor training based at its land-grant university.
5. Teacher educators in agriculture should establish better links with colleagues in other colleges, such as experts in science education, business management, and educational technology.
6. Colleges of agriculture should encourage and help recruit talented students to enter the teaching profession. Departments of agriculture education should develop programs to inform school district counselors about career opportunities in the agricultural education professions.

The changes required to implement these recommendations may come slowly and be painful, but it is necessary if agricultural education is to keep pace with the industry and communities it serves. Central to this change will be a restructured teacher education program that will provide teachers able to deliver educational opportunities in the agricultural sciences, agri-business, nutrition, and land resource stewardship, and able to integrate successfully with their academic peers.

Purpose and Objectives of the Study

The purpose of this study was to determine to what level teacher education programs in the United States have changed since 1988 relative to recommendations as outlined in Understanding Agriculture: New Directions for Education (NRC, 1988). Objectives required to fulfill this purpose were to determine:

1. the number of credit hours required for certification to teach agriculture in the respective states;
2. changes in credit hour requirements for specific courses as implemented since 1988;
3. the breadth and depth in various critical subject matter areas for certification to teach agriculture in the respective states;
4. the frequency with which participants' academic departments engaged in activities recommended in New Directions; and
5. the level of agreement participants held with recommendations as outlined in New Directions.

Methods and Procedures of the Study

The population for the study consisted of faculty employed in departments that prepare individuals to teach agriculture in the public schools. The directory published by the American Association of Agricultural Educators (AAAE) was used to draw the sample. A purposeful sample of 100 individuals was drawn with at least one individual from each institution (represented in the directory) included in the sample. The researcher developed a five-part survey instrument, based on the recommendations outlined in New Directions. The five parts requested information on: 1) course and program requirements; 2) changes in requirements since 1988; 3) breadth and depth issues; 4) frequency of recommended department activities; and 5) agreement disagreement with recommendations. A panel of experts reviewed the instrument for content and face validity prior to its use. Changes were made based on their recommendations. The instrument was pilot tested using survey research specialists with suggestions incorporated into the final document.

The survey was mailed to all 100 individuals in the sample with instructions for completion and a self-addressed, stamped envelope for its return. A total of 65 surveys were returned for a 65% response rate. Due to a clerical error, identification numbers were not coded on the surveys; therefore, early vs. late returnees were examined and found to have no significant differences. Of the 65 returned surveys, four were not utilized because respondents indicated their institutions did not have teacher education programs or participants were too new to their positions to have the needed information. Three surveys were duplicates of responses from institutions as determined by an examination of the postmarks so they were only utilized for the data analyses of Parts 4 and 5. This resulted in 58 surveys with usable data for the analyses in Parts 1-3 and 61 for Parts 4 and 5. Data were analyzed using SPSS for the PC. Frequency distributions and descriptive statistics were calculated for the analyses.

Results of the Analysis

Most respondents indicated they have similar requirements for traditional methods and educational foundations courses—one or two classes in each category. However, they differed in the number of credit hours required for student teaching with 58% (n=30) requiring 6-12 hours and 42% (n=22) requiring 12 or more hours (Table 1).

An examination of Table 1 reveals that some level of biology is required for all the responding certification programs, but chemistry is not required in 8 (14%) of them and physics is not required in an overwhelming 75% (n=42) of the responding programs. However, 57% of the respondents indicated they do require at least some level of other science courses. All of the programs also require at least one mathematics course.

Other courses that were recommended as part of New Directions are not being required by many of the responding institutions. For example, 82% (n=41) require no international agriculture, 80% (n=41) no public policy, 67% (n=32) no issues-based environmental education and 59% no additional technology courses (n=32). It should also be noted that, in the programs in which coursework in these areas is required, the requirements are mostly for 1-5 semester hours (Table 1).

Respondents were asked to indicate whether the hours required for certification in the same content areas as identified in Table 1 had changed since 1988. Over 50% of the respondents indicated that there were no changes for requirements in any of the areas (Table 2). The most notable were in areas such as the sciences, mathematics, international agriculture, public policy, and technology—areas specifically mentioned in the recommendations for teacher education in agriculture in New Directions. However, there were notable increases in the hours required for educational foundations, student teaching, technology, and environmental education. Few programs required any sequence of coursework beyond those traditionally incorporated into teacher education programs—methods, student teaching, biology, chemistry, mathematics, and economics (Table 3). Only two programs (4%) reported a minimum requirement of three biology courses in sequence while three programs (6%) reported a minimum requirement of at least three other science or economics courses in sequence.

Table 1
Program Requirements for Certification in Agriculture

		# Hours Required**			
Course	# Programs*	0	1-5	6-11	≥12
			n/(% of Total)		
Traditional Methods	53	0 (0)	29 (55%)	19 (36%)	5 (9%)
Student Teaching	52	0 (0)	0 (0)	30 (58%)	22 (42%)
Educational Foundations	58	0 (0)	22 (38%)	29 (50%)	7 (12%)
Biology	57	0 (0)	30 (53%)	22 (39%)	5 (8%)
Chemistry	58	8 (14%)	28 (48%)	22 (38%)	0 (0)
Physics	56	42 (75%)	13 (23%)	1 (2%)	0 (0)
Other Sciences	51	22 (43%)	16 (31%)	9 (18%)	4 (8%)
Mathematics	58	0 (0)	30 (52%)	26 (45%)	29 (3%)
Economics	54	2 (4%)	23 (43%)	25 (46%)	4 (7%)
International Agriculture	50	41 (82%)	9 (18%)	0 (0)	0 (0)
Public Policy	51	41 (80%)	7 (14%)	3 (6%)	0 (0)
Internships	52	36 (69%)	12 (23%)	2 (4%)	2 (4%)
Independent Study	47	0 (0)	42 (89%)	5 (11%)	0 (0)
Issues-Based Environmental Ed	48	32 (67%)	15 (31%)	1 (2%)	0 (0)
Other Technology	54	32 (59%)	17 (31%)	3 (6%)	2 (4%)

*Total=58; No significant difference found between early and late respondents.
**Quarter hours converted to semester hours, 1 quarter hour = 2/3 semester hour.

Respondents were given a series of 23 Likert-scaled statements and asked to indicate to what level they agreed with recommendations for teacher education in agriculture programs and colleges of agriculture as outlined in New Directions. The responses ranged from "1" (Strongly Disagree) to "4" (Strongly Agree). A calculation of the mean of the responses revealed that respondents agreed with most of the statements (α=. 90) (Table 4). In fact, they agreed somewhat strongly with at least six statements:

- Colleges of agriculture should encourage and help recruit talented students (Mean=3.9);
- Teacher education should strengthen instruction in technology (Mean=3.7);
- Departments should develop programs to inform counselors about career opportunities in agricultural education (Mean=3.6);
- Colleges of agriculture should be more involved with inservice activities (Mean=3.6);
- Teacher education should strengthen instruction in science (Mean=3.5);
- Teacher education should form links between colleges of agriculture and education to develop new inservice activities and programs (Mean 3.5).

Of the remaining 17 statements, three had a mean response of < 3.0 which indicated less than agreement with the statements (Table 4):

- Emphasis needed on new methods to teach public policy;
- Each state should have a center for teacher, administrator, and counselor training based at its land grant university; and
- Each state should have a center for curriculum design based at its land grant university.

Table 2
Trends in # Hours Required for Certification to Teach Agriculture Since 1988

Course	# Programs*	Trends in # Hours Required		
		No Change	Increased	Decreased
			n/(% of Total)	
Traditional Methods	56	36 (64%)	10 (18%)	10 (18%)
Student Teaching	56	34 (61%)	20 (36%)	2 (3%)
Educational Foundations	56	31 (55%)	20 (36%)	5 (9%)
Biology	56	49 (88%)	7 (12%)	0 (0)
Chemistry	56	49 (88%)	7 (12%)	0 (0)
Physics	55	51 (93%)	2 (3.5%)	2 (3.5%)
Other Sciences	55	41 (75%)	12 (22%)	2 (3%)
Mathematics	56	47 (84%)	6 (11%)	3 (5%)
Economics	56	49 (88%)	7 (12%)	0 (0)
International Agriculture	55	50 (91%)	5 (9%)	0 (0)
Public Policy	54	50 (93%)	4 (7%)	0 (0)
Internships	56	46 (82%)	10 (18%)	0 (0)
Independent Study	55	53 (96%)	1 (2%)	1 (2%)
Issues-Based Environmental Ed	54	37 (69%)	16 (30%)	1 (1%)
Other Technology	55	35 (64%)	19 (35%)	1 (1%)

*Total=58; No significant difference found between early and late respondents.

Table 3
Breadth and Depth of Course Requirements for Certification to Teach Agriculture

Course	# Programs*	Course Sequence Requirements		
		None or Doesn't Apply	Minimum Two	Minimum Three
			n/(% of Total)	
Traditional Methods	56	17 (30%)	18 (32%)	21 (38%)
Student Teaching	55	22 (40%)	12 (22%)	21 (38%)
Educational Foundations	54	26 (48%)	14 (26%)	14 (26%)
Biology	53	26 (49%)	25 (47%)	2 (4%)
Chemistry	53	29 (55%)	24 (45%)	0 (0)
Physics	53	52 (98%)	1 (2%)	0 (0)
Other Sciences	52	41 (79%)	8 (15%)	3 (6%)
Mathematics	52	32 (62%)	20 (38%)	0 (0)
Economics	52	26 (50%)	23 (44%)	3 (6%)
International Agriculture	53	53 (100%)	0 (0)	0 (0)
Public Policy	54	53 (98%)	1 (2%)	0 (0)
Internships	56	50 (89%)	6 (11%)	0 (0)
Independent Study	54	53 (98%)	1 (2%)	0 (0)
Issues-Based Environmental Ed	53	52 (98%)	1 (2%)	0 (0)
Other Technology	53	47 (89%)	6 (11%)	0 (0)

*Total=58; No significant difference found between early and late respondents.

Participants were also given a list of 21 Likert-scaled items and asked to indicate to what extent their department and/or college engages in certain activities as recommended in New Directions. The responses ranged from "1" (Not at All") to "6" (All of the Time). Mean scores were calculated for the responses which indicated that most activities are occurring less than frequently (α=. 93) (Table 5). Respondents indicated that their departments/colleges were involved most of the time to all of the time in only five of the 21 recommended activities:

- Programs to inform counselors about career opportunities in agricultural education;
- Inservice activities for guidance counselors
- Creation of new materials and courses for agricultural literacy
- Inservice activities for agricultural literacy initiatives;
- Working cooperatively with agricultural researchers to develop information for high school agriculture teachers.

Table 4
Level of Agreement With Recommendations Outlined in New Directions (n=61)

Recommendation	Mean*	S.D.
Colleges of agriculture should encourage and help recruit talented students	3.9	.6
Teacher education should strengthen instruction in technology	3.7	.5
Departments should develop programs to inform counselors about career opportunities in agricultural education	3.6	.5
Colleges of agriculture should be more involved with inservice activities	3.6	.5
Teacher education should strengthen instruction in science	3.5	.6
Teacher education should form links between colleges of agriculture and education to develop new inservice activities and programs	3.5	.6
Teacher education should form links with the private sector to develop new inservice activities and programs	3.4	.6
Emphasis needed on new methods to teach principles of science to agriculture students	3.4	.7
Establish links with experts in educational technology	3.4	.6
Establish links between agricultural education administrators and faculty in colleges of agriculture and education	3.4	.6
Colleges of agriculture should be more involved in curriculum reform	3.4	.7
Teacher education should strengthen instruction in agribusiness marketing and management	3.3	.5
Colleges of agriculture should be more involved in creation of new materials and courses for agricultural literacy	3.3	.7
Establish links with experts in science education	3.3	.7
Establish links with extension to develop inservice programs	3.2	.7
Teacher education should strengthen instruction in international agriculture	3.2	.7
Emphasis needed on new methods to teach international agriculture	3.1	.9
Establish links with experts in business management	3.0	.6
Teacher education should strengthen instruction in public policy	3.0	.8
Emphasis needed on new methods to teach agribusiness marketing and management	3.0	.9
Emphasis needed on new methods to teach public policy	2.9	.9
Each state should have a center for teacher, administrator, and counselor training based at its land grant university	2.6	1.0
Each state should have a center for curriculum design based at its land grant university	2.5	1.0

*Range of Responses from "1" = Strongly Disagree to "4" = Strongly Agree; α=.90

Respondents indicated that their departments/colleges were involved rarely or only occasionally in seven of the 21 recommended activities:

- Utilization of links with experts in business management;
- Working cooperatively with agriculture researchers to develop information for distribution to elementary teachers;
- Working cooperatively with agriculture researchers to develop information for distribution to middle school teachers;
- Working cooperatively with agriculture researchers to revise materials for middle school teachers;
- Working cooperatively with agriculture researchers to revise materials for elementary school teachers;
- Working collaboratively with extension to provide inservice for extension staff
- Inservice activities for public school administrators.

Table 5
Frequency of Recommended Departmental Activities (n=61)

Recommended Activity	Mean*	S.D.
Programs to inform counselors about career opportunities in agricultural education	5.1	1.2
Inservice activities for guidance counselors	4.8	1.1
Create new materials and courses for agricultural literacy	4.6	1.2
Inservice activities for agricultural literacy initiatives	4.4	1.4
Work cooperatively with ag researchers to develop information for high school agriculture teachers	4.0	1.7
Utilize links with experts in educational technology	3.9	1.5
Work cooperatively with ag researchers to revise materials for high school agriculture teachers	3.6	1.7
Utilize links with experts in science education	3.4	1.5
Inservice activities for middle school teachers	3.3	1.5
Involved in curriculum reform efforts	3.3	1.5
Create new materials and courses for middle school teachers	3.2	1.7
Create new materials and courses for high school agriculture	3.1	1.7
Inservice activities for high school agriculture teachers	3.1	1.5
Recruit talented students to enter teaching profession	3.0	1.6
Utilize links with experts in business management	2.8	1.3
Work cooperatively with ag researchers to develop information for distribution to elementary teachers	2.8	1.6
Work cooperatively with ag researchers to develop information for distribution to middle school teachers	2.8	1.6
Work cooperatively with ag researchers to revise materials for middle school teachers	2.7	1.6
Work cooperatively with ag researchers to revise materials for elementary school teachers	2.6	1.5
Work collaboratively with extension to provide inservice for extension staff	2.1	1.0
Inservice activities for public school administrators	2.0	1.0

*Range of responses from "1" = Not at All to "6" = All of the Time; α=.93

Conclusions, Recommendations and Implications

Based on the data analysis, it is concluded that teacher education in agriculture programs in the United States have not changed to any extent in response to the specific recommendations for teacher education made in Understanding Agriculture: New Directions for Education (NRC, 1988). Many respondents indicated in "side notes" to the researcher that they have made changes in their programs over the past few years. Those changes did not appear to be related to New Directions or evident in the review of the data on what changes have been made in course requirements for certification since 1988. While participants expressed agreement with all of the recommended activities outlined in New Directions, they also indicated that their respective departments are not engaged to a high level of frequency with many of those activities.

It is recommended that individuals responsible for teacher education and certification in agriculture become more familiar with the recommendations outlined in New Directions. If appropriate, consideration should be given to enhancement of coursework as indicated in the recommendations as well as increased linkages with experts in other education disciplines, technical research areas, and extension. The recommendations outlined in New Directions were made in a sincere desire to recognize the need for teacher education to change along with the foci of secondary programs. They should be given serious consideration as a part of the strategic planning process to improve teacher education in agriculture.

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Impact of Understanding Agriculture: New Directions for Education on Planning in Teacher Education

A Critique

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This study is very timely and addresses a topic of critical importance to all agricultural educators. The report, Understanding Agriculture: New Directions for Education, provided many sound recommendations for changes in agricultural teacher education and these changes were widely discussed and debated within the agricultural education profession during and after the completion of the report. The introduction and theoretical base is well written and provided a sound foundation for the study.

The research procedures used were appropriate and accomplished the objectives of the study. It would have been interesting and instructive if the author would have included breakouts of the data by program characteristics.

No information was provided about the characteristics of the respondents or their institutions. It is impossible to tell whether the respondents were primarily from 1862 land grant, 1890 land grant or non-land grant institutions. No demographic information is provided on the respondents, such as academic rank, states represented, whether the programs were based in Colleges of agriculture or education, or other descriptive information. In the absence of this information, it is difficult to evaluate the results.

The conclusions and recommendations section needs substantial strengthening. The findings of this study provide a strong basis for concern on the part of agricultural teacher educators. Much stronger conclusions and recommendations are justified and can be crafted based on the results/findings of this study.

The most worrisome aspect of this study is that so little has changed after many agricultural educators spent so much of their time and effort to research and prepare the national report. This author and others may wish to pursue this line of research further to determine why the recommended changes have not been implemented and to determine the true potential for change in agricultural teacher education programs.

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Concurrent Session D

Theme:
Instructional Methods

Chairperson:
Susan Fritz
University of Nebraska

Discussant:
Ed Osborne
University of Florida

Facilitator:
N.L. McCaslin
Ohio State University

Changing the Opportunities Provided for Cognitive Processing in College of Agriculture Classrooms

M. Susie Whittington, Penn. State Univ.
Gretchen L.T. Bowman, University of Idaho
Humphrey G. Tirima, University of Idaho

Comparing Academic Rigor in On-Campus and Off-Campus Courses: Perceptions of College of Agriculture Faculty

Greg Miller, Iowa State University
Ching-Chun Shih, Iowa State University

Relationships Between Instructional Method and Critical Thinking in a Turfgrass Management Course

William J. Houser, Penn. State Univ.
D. R. Huff, Pennsylvania State University
Rama B. Radhakrishna, Clemson University

The Effects of World Wide Web Instruction and Traditional Instruction and Learning Styles on Achievement and Changes in Student Attitudes in a Technical Writing in Agricommunication Course

Tina M. Day, Mississippi State University
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Changing The Opportunities Provided For Cognitive Processing In College Of Agriculture Classrooms

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Introduction

Cognitive psychologists portray learners as "processors of information" and assign critical roles to the knowledge and perspective students bring to their learning. In the view of cognitive psychology, "that which learners do determines the level of understanding they ultimately achieve" (Glover, 1990, p. 1). Experience suggests that this concept from cognitive psychology holds considerable power for educational practices. For example, Perry (1978) suggested that consistent underlying cognitive structures acted as filters through which individuals viewed the world and that these structures assisted the individual in organizing and interpreting the classroom experience at hand. Simon (1976) concluded that, when cognitive scientists do information-processing analyses of complex skills, they find the same kinds of basic problem-solving processes used in task after task. These "metacognitive skills" have been shown by Brown et. al (1983) to be characteristic of effective learners, good readers and writers, and strong problem solvers. What, then, are professors doing inside classrooms to engage students in their role as "processors of information"?

Practices Inside Classrooms

Professors have been accused of falling short of encouraging students to think beyond rote memorization of facts. Paul (1993) wrote, "Approximately 80% of teaching is at the didactic [knowledge] level, 14% at the tactical [comprehension, application] level (engagement without intellectual skill development), 4% at the analytic [analysis] level, 0.9% at the holistic [synthesis] level, and 0.1% at the exemplary [evaluating] level" (p. 27). Whittington and Newcomb (1991) studied 10 professors in a college of agriculture and reported that participants' cognitive level of classroom discourse was distributed as follows: remembering [knowledge] level discourse was presented 42% of the time, processing [comprehension, application, and analysis] oriented activities were used 31% of the time, while creating [synthesis] level discourse occurred 5% of the time and evaluating level discourse was presented in the classroom less than 1% of the time.

In a study of college professors, Miller (1989) found that a preponderance of oral presentations by teachers typically reflected thinking at the lower levels of cognition. Fisher and Grant (1983) found that discourse in college courses was predominantly at the lowest levels of cognition, regardless of the kind of institution, course level, subject area, or length of topic or session. These findings are consistent with those of Pickford (1988) who reported that professors conducted 94% of their discourse at the knowledge, comprehension, application, and analysis levels of cognition.

Granted, fundamental instruction focusing upon facts, dates and theories is necessary and provides students with an essential foundation for further learning, but the mere knowledge of facts is not a sufficient goal in education (Newcomb and Trefz, 1987; Cano, 1988). According to Bender (1965), the ability to transfer knowledge and skills learned to other situations is the implicit goal of any educational endeavor. Gibson and Chandler (1988) wrote that the goal of education was to challenge students "to learn how to apply facts in new situations, to analyze and synthesize the information they take in, and, finally to make judgments about what they have found" (p. 433). Their goal of education was derived from a classification system for cognitive abilities developed by Bloom (1956).

Bloom's Classification of Thinking Processes

The Taxonomy of Educational Objectives: Cognitive Domain, developed by Bloom et al. (1956), was built on a theory of varying levels of cognitive complexity. In this hierarchical theory, students were encouraged to think beyond the two lower levels of mental processing, "knowledge" and "comprehension", to the higher levels of, "application", "analysis", "synthesis", and "evaluation". Using Bloom's Taxonomy as a framework for classifying levels of thinking provides focus and direction for professors interested in improving the quality of learning in their classrooms (Newcomb and Trefz, 1987; Cano, 1988).

Statement of the Problem

With increasing emphasis on students' ability to demonstrate critical thinking skills, the need for instructors to "teach-by-example" and to provide structure for students to practice that type of higher order cognitive activity also increases. According to Meyers (1986, p. 47), "By modeling reflective thought in lectures and discussions, teachers can do much to encourage this frame of mind in their students."

Purpose and Objectives of Study

The purpose of this three-year quasi-experimental study was to assess the cognitive level of instruction in college of agriculture classrooms, design and implement a nine-month intervention, and determine the effects of the intervention among selected faculty members in a College of Agriculture. The study included an in-depth examination and compilation of 28 case studies. Specific research questions were:

1. At what level of cognition were participants teaching?
2. What treatment(s) can be developed and implemented that will influence the cognitive level at which professors teach?
3. Which observable classroom behaviors, found to enhance opportunities for students to think at higher cognitive levels, can be modified through intervention?

Procedures

A three-year project was undertaken in a college of agriculture to examine teaching behaviors that encourage students to think during classroom sessions. Procedures for years one through three are addressed in this section.

Year one focused on gathering baseline data related to the cognitive level at which participants were teaching (Whittington, 1995). Thus, the cognitive level of classroom discourse (the formal speech or conversation delivered during class) was described by employing the Florida Taxonomy of Cognitive Behavior ("FTCB" by Webb, 1970). The FTCB utilized 55 categories of observable behaviors indicative of the various cognitive levels identified by Bloom's Taxonomy (see Figure 1). Validity for this instrument was based upon its direct development from Bloom's Taxonomy and the support generally given to this hierarchy of cognitive behaviors. Reliability for this instrument was established by coding audio-tapes of lectures and establishing Spearman Rho reliability coefficients. Intra-rater reliability was approximately r = .96. Inter-rater reliability between previous researchers and the researchers in this study was approximately r = .98.

Figure 1

Bloom's Taxonomy -- A Hierarchy of Thought Processes

Evaluation
↑
Synthesis
↑
Analysis
↑
Application
↑
Comprehension
↑
Knowledge

Participants were observed and audio-taped during six randomly selected class sessions, approximately every two weeks, but avoiding the first ten days and the final ten days of the semester. Participants were aware of the days the researchers would be in attendance. The observations were split evenly between raters.

Year two was an exploratory intervention combining experimental and qualitative methods. Participants were randomly divided into three treatment levels designed to explore potential for influencing the cognitive level at which professors teach. The nature of the treatment levels was explained to each participant along with their random assignment to one of the levels. Descriptions of the treatment levels follow:

Levels of Intervention

Awareness (Level I) - The researchers brought together all participating faculty for a two-hour workshop to share and discuss results of cognition studies and to suggest techniques for teaching at higher cognitive levels.

Resources (Level II) - Participants attended the same workshop (at the same time) as the participants in Treatment Level I. In addition, participants in Treatment Level II received, on a monthly basis for eight months (September-May, but avoiding March), reading materials and resources targeted at enhancing one's ability to teach at the higher levels of cognition. Each reading selection was accompanied by a cover sheet to be returned to the researchers. The cover sheet requested that the reader describe how they would apply the concepts presented in the reading selection to their own teaching program. Returned cover sheets were used to assist in tracking readership and understanding of the materials presented to the participants. Specifically, resources included: Teaching for critical thinking (Chaffee, 1994); What happened to thinking? (Parker, 1993); Thought and knowledge (Halpern, 1984--divided into two readings); Critical thinking: How to prepare students for a rapidly changing world (Paul, 1993--selected excerpts); Discussion-method teaching: How to make it work (Welty, 1989); Methods of teaching agriculture: Learning as problem solving (Newcomb, McCracken, & Warmbrod, 1986- selected chapters); and, The Students Are...(Anonymous).

Development (Level III) - Participants attended the same initial two-hour workshop as participants in the other two groups. In addition, participants in Treatment Level III were involved in eight one-hour sessions (one per month from September-May, except March) to explore teaching so as to help learners operate at the higher levels of cognition. The monthly meetings took the form of a workshop and/or discussion group during which the following topics were addressed:

- Workshop #1. What did we learn (report of findings from year one)?
- Workshop #2. Writing objectives across the levels of cognition.
- Workshop #3. An introduction to learning styles.
- Workshop #4. Learning styles utilized in teaching across the levels of cognition.
- Workshop #5. Sharing your best-kept secret (a collection of participants' thoughts and applications of techniques for teaching across the levels of cognition).
- Workshop #6. Questioning strategies for reaching higher cognitive levels.
- Workshop #7. Documenting your teaching effectiveness.
- Workshop #8. Barriers to teaching at higher cognitive levels.

During **year three** the baseline data collected during year one were collected again to determine the extent of change in the distribution of observed professor discourse, and thus opportunities presented for students to think across the levels of cognition.

Population and Sample

The accessible population for this study included faculty members in a college of agriculture who held a teaching appointment and were teaching at least one undergraduate course. To hold numerous variables constant, interviews were conducted with department chairs to determine faculty members who were "good teachers" as evidenced by interest in improving teaching, exit interview comments by students, attendance at teaching seminars, and student evaluations of teaching. From the list of nominees, 30 faculty members who taught freshman through senior level courses, were purposefully selected, however, involvement was voluntary. These faculty represented all departments/schools in the college.

Dependent Variable

The previous three treatment levels were designed and implemented to allow researchers opportunities to measure change, if any, in the cognitive level of discourse used by professors in college of agriculture classrooms following the treatment.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) on the mainframe computing system. More specifically, frequencies of behaviors observed across all cognitive levels were totaled. Then, frequencies within each cognitive level were divided by the overall total to acquire percentages of classroom discourse at each cognitive level. Cross-tabulations, frequencies, and means were calculated.

Results

Assessed Cognitive Level of Instruction--Year One

The discourse of participants during year one was assessed to be approximately 88% at the lower cognitive levels (knowledge = 47%, comprehension = 33%, application = 8%). Participants' discourse was approximately 10% at the analysis level, 1.5% at the synthesis level with a range of 0 to 6%. Evaluation level discourse was assessed at less than 1%.

Discourse most frequently used in classrooms is noted in Table 1. As can be seen, a professor most often "identifies something by name". "Gives a specific fact" was the item observed second most frequently. Note that items occurring most often (rated first, second, or third) were all at the "knowledge" (lowest) level of cognition. None of the ten most observed items were at the "analysis, synthesis, or evaluation" (higher) levels of cognition.

Table 1

Classroom Discourse Most Often Presented in Year One

Discourse by Cognitive Level	Rating
Knowledge	
Identifies something by name	1
Defines meaning of term	3
Gives a specific fact	2
Tells about an event	10
Gives steps of a process	9
Comprehension	
Gives concrete example	4
Verbalizes from a graphic	5
Gives a reason/tells why	6
Shows similarities/differences	8
Application	
Applies previous learning	7

Note. No analysis, synthesis, or evaluation occurred in the 10 most frequently observed items.

Assessed Cognitive Level of Instruction--Year Three

The discourse of participants during year three (following the intervention) was assessed to be approximately 79% at the lower cognitive levels (knowledge = 36%, comprehension = 37%, application = 6%). Participants' discourse was approximately 14.5% at the analysis level and 3.7% at the synthesis level. Evaluation level discourse was assessed at 1.7%.

Discourse most frequently used in the classrooms during year three is noted in Table 2. As can be seen, professors most often "gave concrete examples". "Giving reasons/telling why" was the item observed second most frequently. Note that items occurring most often (rated first or second) were at the "comprehension" level of cognition. The third most observed item, "shows interaction or relationships" was an "analysis" level item. No items in the ten most observed were "synthesis, or evaluation" (higher) cognitive level items.

Change in Prevalent Classroom Behaviors

As noted above, the frequency of observed behaviors at the knowledge level of cognition decreased while the frequency of observed behaviors at the higher cognitive levels increased. More specifically, the frequency of knowledge level discourse presented in college of agriculture classrooms decreased from 47% to 36%, comprehension level discourse increased from 33% to 37%, and application level discourse decreased from 8% to 6% while analysis level discourse increased from 10% to 14.5%, synthesis level discourse increased from 1.5% to 3.7%, and evaluation level discourse increased from .6% to 1.7%.

Table 2

Classroom Discourse Most Often Presented in Year Three

Discourse by Cognitive Level	Rating
Knowledge	
Identifies something by name	5
Defines meaning of term	8
Gives a specific fact	6
Tells about an event	9
Gives steps of a process	4
Comprehension	
Gives concrete example	1
Verbalizes from a graphic	7
Gives a reason/tells why	2
Shows similarities/differences	4
Shows cause/effect	4
Application	
Applies previous learning	10
Analysis	
Shows interaction or relationships	3

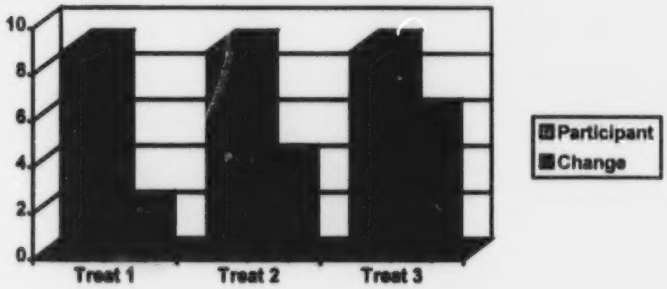
Note. No synthesis or evaluation occurred in the 10 most frequently observed items.
Three items are listed as fourth most frequent.

Change in Participants Per Treatment Level

As can be seen in Figure 2, of the nine participants in Treatment Level I (Awareness), one professor experienced at least a 10% cognitive level shift in observed discourse delivered in the classroom. In other words, there was at least a 10% decrease in frequency of observed discourse delivered at the knowledge level while there was a 10% increase in frequency of observed discourse delivered at the analysis, synthesis, and evaluation levels. For Treatment Level II (Resources), four professors changed by at least 10%, while at Treatment Level III (Development), six professors experienced at least a 10% cognitive shift in observed discourse delivered in the classroom.

Figure 2

Change in Participants per Treatment Level



Note. Treatment Level I = Awareness, Treatment Level II = Resources, Treatment Level III = Development

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Conclusions

1. Faculty members in this study conducted discourse primarily at the knowledge and comprehension levels of cognition.

2. During year one, participants in this study delivered discourse items that were primarily assessed to be at the knowledge level of cognition; none of the most frequently observed behaviors were delivered at the higher cognitive levels.

3. During year three, participants in this study delivered discourse items that were primarily assessed to be at the comprehension level of cognition; one of the most frequently observed behaviors was delivered at the analysis level of cognition.

4. Following the nine-month intervention, the percentage of classroom discourse delivered at the knowledge level decreased while the percentage of classroom discourse delivered at the analysis, synthesis, and evaluation levels increased.

5. Following the none-month intervention, at least one participant in each of the Treatment Levels experienced a change in the frequency of classroom discourse delivered at the higher cognitive levels. The percentage of participants who experienced positive change in delivering higher cognitive level discourse, increased as the treatment became more intense. Thus, a greater number of participants in Treatment Level III than the other two groups, were found to have increased their cognitive level of classroom discourse.

Discussion

Participants in this study taught courses in various subject matter areas. They taught the courses to freshman through senior level students. However, professors conducted classroom discourse at cognitive levels lower than synthesis and evaluation levels of cognition, regardless of the course level or subject matter. This issue is consistent with a concern of Fisher and Grant (1983) who also found that discourse in college courses was predominantly at the lowest levels of cognition, regardless of the course level or subject area. This seems to defy logic that would suggest that the distribution of discourse towards the higher levels of cognition would tend to occur as students moved toward the conclusion of their studies in most fields of agricultural sciences.

Data from this study showed that professors conducted discourse at lower levels of cognition 88% of the time in year one and 79% of the time in year three. These data are consistent with findings of Pickford (1988) and Miller (1989) who reported that professors conducted a preponderance of discourse at the lower levels of cognition. However professors in their studies conducted much higher percentages, 94% and 98%, respectively, of their discourse at lower levels than did the professors in this study.

Newcomb and Trefz (1987) found that professors wanted to change their cognitive level of discourse; this study reveals that behaviors known to demonstrate increased cognitive activity during class can be increased through intervention. For example, following the nine-month "Development" intervention, participants experienced an increase in the frequency of classroom discourse delivered at the analysis, synthesis, and evaluation levels. Specifically, a positive change occurred in the opportunities given to students to "show cause and effect relationship", "apply previous learning to new situations", "show interaction or relation of elements", "check hypotheses with given information", and "evaluate from a given criterion". Thus, professors, through their discourse, increased the opportunities given for students to utilize their thinking capacities at the higher cognitive levels.

Recommendations

1. Professors must change their approach to the use of in-class time if they are to conduct discourse at the higher cognitive levels. In fact, it is likely that there must be less teacher-discourse if there is to be more opportunity for students to improve their ability to operate at the highest levels of cognition.

2. Educating professors regarding their cognitive level of instruction is necessary if change is to occur. Professors aspire to teach at higher cognitive levels because they theoretically see the benefits of teaching at higher cognitive levels, but they are not reaching the higher cognitive levels. The problem, therefore, could be lack of knowledge of techniques and methods used to model higher cognitive levels of instruction. Intensive, long-term workshops and seminars need to be developed and offered to those faculty who desire changes in their cognitive level of teaching.

3. As agricultural educators with expertise in pedagogy, important responsibilities accruing to faculty, not only include preparing preservice teachers of secondary agriculture and extension personnel, but also educating colleagues in colleges of agriculture on current teaching issues. The issue of teaching higher order thinking skills must be addressed in today's learning environment. Every reason exists for teacher educators in agriculture to lead this cause.

4. Agricultural educators who possess the capability to prepare persons for teaching at higher cognitive levels will be called upon by university and college-wide teaching committees, curriculum committees, assessment committees, and planning committees to offer valuable input into the enhancement of teaching.

Recommendations for Further Research

1. Exploring the barriers to teaching at higher cognitive levels.

2. Examining variables, other than the teacher, which influence cognitive levels reached in classrooms.

3. Establishing a clear positive effect between cognitive level of instruction and long-term learning and transfer of learning.

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Changing The Opportunities Provided For Cognitive Processing In College Of Agriculture Classrooms

A Critique

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This paper describes a creative and well executed research study that makes a definite contribution to our knowledge base in effective teaching and learning in higher education. Unfortunately, few research endeavors in our field are carefully planned and designed multi-year efforts that include both descriptive and experimental dimensions. However, this study consisted of three, one-year phases, with the third year focusing on treatment effects on the cognitive level at which professors teach. I congratulate this research team for the quality and duration of this study and the intriguing questions that it suggests.

This paper begins with a very nicely presented introduction that provides a solid chain of reasoning to support the need and importance of the study. This is followed by a rather detailed review of research findings on the cognitive level of classroom discourse presented by college professors. In general, these research findings have shown that college professors use lower levels of cognitive discourse over 90% of their instructional time. Although this review of research is essential and well targeted, it falls short of providing a complete literature review that also presents the theoretical or conceptual model that drives the study. For example, a key element of this model would suggest a strong relationship between professors' cognitive level of discourse, students' higher order thinking activity and ability, and learning.

I challenge the researchers to rethink their problem statement so that it specifically states the problem observed or believed to exist in the field that this research will help to resolve. The purpose, objectives, and procedures used in the study were appropriate and well described. The use of Bloom's taxonomy as the theoretical anchor in the study, coupled with use of the FTCB instrument to assess and classify behaviors, resulted in a very solid approach. The authors should have indicated how many of the courses observed were at the introductory versus advanced level, as well as any differences observed across subject matter areas. Were all classes observed of a lecture format (versus discussion or lab)? Also, were the readings for Group 2 similar in content to the discussions for Group 3? Was there any experimental mortality during the three-year study? During the treatment, were the professors taught how to use the behaviors that reflect higher order cognitive activity? Results and conclusions of the study were clearly presented. Are the findings of practical significance? Several statements in the discussion and recommendations sections warrant further review. For example, I would challenge the assumption that higher levels of discourse can be expected to occur in advanced courses - perhaps professors are merely presenting more advanced information

Comparing Academic Rigor in On-campus and Off-campus Courses: Perceptions of College of Agriculture Faculty

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Introduction

Academic rigor is a popular topic of discussion among the stakeholders in education. Despite its popularity, there is a paucity of research and scholarship on the topic. What is academic rigor? Braxton (1993) characterized rigor as the demands that course processes make on students to demonstrate higher cognitive levels of achievement as defined by Bloom's (1969) taxonomy of educational objectives. Unks (1979) asserted that rigor in its best sense means challenging each student toward individual excellence. Rigor is a careful, continual self-motivated process toward excellence in thinking, feeling, analyzing, evaluating, relating to others, learning to learn and becoming one's own best teacher. Accordingly, a rigorous course gives students the opportunities to reach the higher levels of cognitive learning, achieve academic excellence, and actively participate in the learning process.

Bloom (1969) developed a hierarchy of cognitive learning that includes the following levels: (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation. Higher levels of cognitive learning are associated with a deeper understanding of concepts. Teaching to higher cognitive levels can challenge students to reach the extent of their own abilities while participating in the thorough, logical and scientific process of solving real problems (Unks, 1979).

Students develop deeper understandings when they are actively seeking solutions for themselves (Purkiss, 1995; Newcomb, McCracken, and Warmbrod, 1993). Active learning is a key component of constructivist learning theory. Constructivism explains learning as a process in which students interact with the physical and social environments (Fosnot, 1996; Taylor, 1996). Based on Piaget's biological model and Vygotsky's emphasis on the sociohistorical aspect of knowledge, the theory of constructivism regards learning as an active process in which students themselves have to construct meaning. Students should be challenged to create their own ideas in dealing with the intellectual problems presented to them (Gruender, 1996).

Taylor (1996) further explained constructivist learning theory as a developmental process by which students improve from a lesser to a more perfect understanding. Thus, the responsibility of the teachers is to provide students with active learning opportunities in exploring patterns, raising their own questions, and building their own models. In essence, autonomy, independence, and empowerment become the goals (Keegan, 1986; Fosnot, 1996).

How do off-campus courses compare with on-campus courses with regard to academic rigor? Do off-campus courses challenge students to reach higher levels of cognitive learning, achieve academic excellence, and actively participate in the learning process? Off-campus courses are viewed by many in academe as a second best alternative to on-campus courses (Wilson, 1991). According to Dillon and Walsh (1992), faculty resistance is often listed as the major barrier keeping distance education technologies from being implemented. What factors are important for explaining faculty perceptions of academic rigor? Do college of agriculture faculty perceive off-campus agriculture courses to be as rigorous as on-campus courses?

Purpose and Objectives

The purpose of this study was to compare college of agriculture teaching faculty members' perceptions of the academic rigor of on-campus and off-campus courses. The objectives of the study were as follows:

1. Identify factors underlying college of agriculture teaching faculty members' perceptions of the academic rigor of on-campus and off-campus courses.

2. Compare college of agriculture teaching faculty members' perceptions of the academic rigor of on-campus and off-campus courses.

Procedures

The population for this study included faculty members with teaching responsibilities or with teaching experience in the college of agriculture at Iowa State University. The list of the faculty members was provided by the Dean's office. Departmental secretaries checked the list for accuracy. Two hundred and sixty-two faculty members were in the target population during the spring semester of 1997. All 262 faculty members were surveyed.

The questionnaire was designed by the researchers and included two Likert-type scales and one open-ended question. Twenty-two statements representing the academic rigor construct were generated from a review of literature and from input of faculty in agricultural education. College of agriculture teaching faculty were asked to indicate the extent to which they agreed with each statement for on-campus courses and for off-campus courses by using a five-point Likert-type scale with response options ranging from (1) strongly disagree to (5) strongly agree. Faculty were also asked the following open-ended question. In your opinion, what are the most significant differences between on-campus and off-campus courses?

Content and face validity for the questionnaire were established by a panel of six faculty in agricultural education. The Likert-type scales were pilot-tested for reliability with a group of 12 agricultural education graduate students. Cronbach's alpha was used to assess the reliability of the two Likert-type scales. Cronbach's alpha coefficients were .93 and .90 for the on-campus and off-campus academic rigor scales, respectively.

The questionnaire and a cover letter describing the project was sent to all members of the college of agriculture teaching faculty by campus mail. Two follow-ups of nonrespondents were conducted. One hundred thirty-two questionnaires were completed and returned for a response rate of 50.4%. Persons who had not responded 10 days after the final follow-up were considered nonrespondents. Nonresponse error was controlled by randomly sampling 10% (10) of the nonrespondents and gathering data from them. A t-test was used to determine if respondents and nonrespondents differed significantly in their overall perception of the academic rigor of on-campus and off-campus courses. No significant ($p<.05$) difference was found between respondents and nonrespondents. This procedure for handling nonresponse was used because it is the most empirically sound procedure available (Miller & Smith, 1983). Results were deemed generalizable to the population. Respondent and nonrespondent data were pooled yielding a final response rate of 54.2%.

All data were analyzed with the SPSS for Windows personal computer program. Appropriate statistics for description were used including frequencies, percentages, means, standard deviations, and Pearson correlations. Davis' (1971) descriptors were used to interpret the magnitude of all correlations. Exploratory factor analysis was used to identify factors underlying college of agriculture teaching faculty members' perceptions of the academic rigor of on-campus and off-campus courses. Procedures for conducting the factor analysis were patterned after those used by McCaslin and Torres (1992). Because data were gathered from the population instead of a sample, inferential statistics were not used for comparisons. Faculty responses to the open-ended question were analyzed for common themes related to the concept of academic rigor.

Results

College of agriculture teaching faculty who participated in the study were predominantly male (93.6%) and were on average 50 years of age. Regarding academic rank, 60.3 % were professors, 23.4% were associate professors, 14.9% were assistant professors, and 1.4% were instructors. On average, teaching accounted for 34.2% of the teaching faculty members' assigned responsibilities. The teaching faculty had an average of 17.6 years of teaching experience, taught 2.9 course sections per year, and taught an average of .6 course sections off-campus in the last three years. More than half (52.2%) of the teaching faculty had participated in faculty development opportunities related to distance education.

A maximum likelihood (common factors) factor analysis was conducted to identify factors underlying college of agriculture teaching faculty members' perceptions of the academic rigor of on-campus and off-campus courses. Common factor analysis is appropriate when measured variables are assumed to be a linear function of a set of latent variables (Ford, MacCallum, & Tait, 1986). A factor solution was sought that would represent faculty perceptions of academic rigor for the on-campus context and the off-campus context.

Only factors with eigenvalues equal to or greater than one were retained before rotation. Also, a scree plot of the eigenvalues was used in deciding how many factors would be retained. It was determined that three factors were needed to represent faculty perceptions of academic rigor in on-campus courses and off-campus courses. A second maximum likelihood factor analysis procedure was conducted to extract the three factors for the on-campus and off-campus data. The three factors were not assumed to be orthogonal. Therefore, the oblimin rotation procedure was used (Raven, 1994). The factor pattern matrices for the on-campus and off-campus solutions were examined to determine if the three factors were similar for both contexts. Sixteen of 22 academic rigor statements loaded on the same factors in the on-campus and off-campus solutions. The six academic rigor statements that did not load on the same factors were eliminated and a maximum likelihood factor analysis was performed on the remaining 16 items to arrive at the final three factor solution.

Table 1 shows the rotated factor loadings for the final solution. An examination of the items and their factor loadings was used to understand the nature of the three factors. To reduce subjectivity, items with factor loadings equal to or greater than .4 were considered most important when factors were labeled.

Table 1. Rotated factor loadings for faculty perceptions of academic rigor

	Factor Loadings	
Abbreviated items	On-Campus	Off-Campus
Factor one = Active learning		
Students explore course related resources	.70	.53
Students examine various perspectives	.60	.74
Students contribute to class discussions	.54	.57
Students evaluate diverse points of view	.52	.95
Students are active in the learning process	.41	.55
Factor two = Effort		
Students work hard to succeed	.79	.60
Students take challenging examinations	.77	.84
Students study outside of class	.74	.60
Grades are based on high academic standards	.73	.87
Courses are rigorous	.66	.75
Students complete high quality assignments	.49	.66
Students achieve academic excellence	.44	.56
Students complete substantial readings	.43	.29
Factor three = High cognitive levels		
Students synthesize course concepts	.85	.82
Students evaluate course concepts	.84	.76
Students analyze course concepts	.78	.83

The three factors were labeled (1) active learning, (2) effort, and (3) high cognitive levels. The three factors accounted for 56.0% and 60.1% of the variance in faculty perceptions of the academic rigor of on-campus and off-campus courses respectively (Table 2). The Cronbach's alpha reliability estimates for the on-campus academic rigor sub-scales were .82 for the active learning factor, .87 for the effort factor, and .88 for the high cognitive levels factor. The Cronbach's alpha reliability estimates for the off-campus academic rigor sub-scales were .86 for the active learning factor, .89 for the effort factor, and .91 for the high cognitive levels factor. The interfactor correlations for the rotated factors ranged in magnitude from moderate to substantial (Table 3). Therefore, the factors are not independent of each other in explaining the academic rigor construct.

Table 2. Percent of variance explained by factors underlying faculty perceptions of academic rigor

	On-Campus		Off-Campus	
Factors	%	cum. %	%	cum. %
Active learning	41.3	41.3	6.3	6.3
Effort	10.4	51.7	47.7	54.0
High cognitive levels	4.2	56.0	6.1	60.1

Table 3. Interfactor correlations for the oblique rotated factors underlying faculty perceptions of academic rigor

Factors	I On-Campus (Off-Campus)	II On-Campus (Off-Campus)	III On-Campus (Off-Campus)
Active learning (I)	1.00 (1.00)	.46 (-.63)	-.60 (.59)
Effort (II)		1.00 (1.00)	-.40 (-.58)
High cognitive levels (III)			1.00 (1.00)

Table 4 shows the means and standard deviations for faculty perceptions of academic rigor for on-campus and off-campus courses. Overall, teaching faculty provided a higher mean score on the academic rigor scale for on-campus courses. In addition, teaching faculty provided higher mean scores for the active learning, effort, and higher cognitive levels factors for on-campus courses. Higher mean scores were also given to on-campus courses on each of the 16 statements from the academic rigor scale.

Table 4. Means and standard deviations for faculty perceptions of academic rigor

Factors and abbreviated items	On-Campus Mean[a]	On-Campus SD	Off-Campus Mean[a]	Off-Campus SD
Factor one = Active learning	**4.01**	**.64**	**3.70**	**.77**
Students explore course related resources	3.98	.82	3.54	.92
Students examine various perspectives	3.88	.88	3.80	.88
Students contribute to class discussions	4.26	.80	3.71	1.11
Students evaluate diverse points of view	3.74	.92	3.61	.93
Students are active in the learning process	4.22	.69	3.86	.99
Factor two = Effort	**4.20**	**.53**	**3.81**	**.69**
Students work hard to succeed	4.48	.60	4.06	.89
Students take challenging examinations	4.16	.65	3.71	.90
Students study outside of class	4.50	.56	4.26	.79
Grades are based on high academic standards	4.26	.69	3.87	.92
Courses are rigorous	4.08	.79	3.44	1.03
Students complete high quality assignments	4.23	.67	3.85	.90
Students achieve academic excellence	4.36	.70	3.87	.91
Students complete substantial readings	3.80	.95	3.39	.96
Factor three = High cognitive levels	**4.25**	**.71**	**3.91**	**.91**
Students synthesize course concepts	4.23	.78	3.87	.97
Students evaluate course concepts	4.14	.92	3.86	1.01
Students analyze course concepts	4.33	.67	4.00	.96
Overall Mean	**4.21**	**.47**	**3.87**	**.63**

[a] 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree

Faculty were asked what in their opinion were the most significant differences between on-campus and off-campus courses. Comments were analyzed for themes and several comments were related to the issue of academic rigor. When faculty alluded to academic rigor, off-campus courses were described in more negative terms. Faculty comments included the following:

> The level of demonstrated competence and achievement needed to earn a given grade or to pass a course is less for off-campus courses than it is for on-campus courses.
>
> Off-campus courses lack spontaneous interactivity, have less rigorous standards, and use lower grading standards.
>
> There is a tendency for instructors to accommodate and accept poorer academic achievement by off-campus enrollees.
>
> Off-campus courses do not have the same rigor in lab exercises.
>
> Many students who take off-campus courses begin with the expectation that other life/job things are most important. And this "course" should fit into their schedule. As a result, many of these students devote little or no outside time to class. The general feeling around here is that this is a travesty and grave injustice to our students who devote 2, 3, 4, or more years of their life to earning a degree on campus. If off-campus is so great, why do we need a campus?

Conclusions and Recommendations

Based on the results of this study, it was concluded that three factors underlie faculty perceptions of academic rigor. The factors are (1) active learning, (2) effort, and (3) high cognitive levels. The three factors are useful in explaining academic rigor in on-campus and off-campus courses. In addition, the three factors were consistent with the definitions of academic rigor found in the literature (Braxton, 1993; Unks, 1979). To provide a rigorous academic environment, one in which students are challenged to reach a level of understanding of course content that reflects the extent of their own unique intellectual ability, faculty should account for each factor in developing, teaching, and administering their courses.

College teachers of agriculture can encourage active learning by creating opportunities for students to interact with course content, with the instructor, and with other students. Students should be encouraged to examine different points of view and contribute their own ideas to class discussions. Teaching faculty should encourage students to expend effort in meeting high academic standards. Finally teaching faculty should expect students to operate at higher cognitive levels by formulating and teaching to objectives in the upper half of Bloom's (1969) taxonomy.

College of agriculture teaching faculty perceived off-campus courses to be less rigorous than on-campus courses. Are their perceptions well founded? Further research is needed to determine if off-campus courses do in fact provide less opportunity for active learning, require students to expend less effort, and result in lower level cognitive outcomes. If research can show that off-campus and on-campus courses are equivalent in terms of academic rigor, an effort should be made to educate college of agriculture faculty about this equivalence. Solid evidence will be needed to convince some faculty of the value of off-campus courses. Many faculty members hold strongly negative opinions of off-campus courses. For example, Wilson (1991, p. 5) noted that "for long distance education has been perceived as a step-child of higher education; there has been the view that it is "a second-best substitute for on-campus instruction"... tolerated, but not embraced."

Perhaps off-campus courses, as they are currently delivered, truly are less rigorous. If this is the case, agricultural education faculty should lead the way in developing and perfecting methods to get off-campus learners more active in the learning process, to ensure that off-campus learners must put forth effort equal to that of on-campus learners, and to teach and test at higher levels of cognition. With the teaching tools that currently exist there is no reason off-campus courses should be less rigorous. In dealing with the issue of academic rigor, agricultural educators should be principally concerned with enhancing the quality of off-campus courses for students.

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Comparing Academic Rigor In On-Campus And Off-Campus Courses: Perceptions Of College Of Agriculture Faculty

A Critique

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With the rapidly growing emphasis in distance education, this paper addresses a very timely problem and one that causes heated debate in many academic units. Is off-campus instruction equivalent (in content, rigor, etc.) to on-campus instruction? Faculty perceptions on these and related questions are fundamental to an institution's success in delivering instruction via distance. Compounding this debate is the fact (in my opinion) that institutions that provide high quality distance education programs/courses will garner the lion's share of the educational marketplace in the years ahead. If so, the question becomes not if the two delivery formats are equal in rigor and quality, but rather how such quality and rigor can be ensured in both on- and off-campus instructional settings.

The authors of this paper seem to struggle with the notion of academic rigor. Why the focus on rigor? Is rigor a dimension of quality? After implying that no accepted definition of rigor exists, the researchers provide one that seems inadequate and too much like the eventual outcomes of the study. The subsequent literature review narrowly focuses on the same three dimensions of rigor that were presented in the researchers' definition. This section of the paper should be wrapped around a conceptual model that explicitly indicates the relative position/influence of factors which, in theory, affect and are affected by the quality of instruction in higher education.

The authors should indicate what is meant by off-campus instruction. Distance education and off-campus instruction are not synonymous terms, yet they seem to be so used throughout the paper. Also, were graduate or undergraduate (or both) courses considered in this analysis of rigor? The factors that comprise faculty feelings of resistance (including perceptions of less rigor) in offering distance education are certainly in need of further investigation.

The researchers should be commended for a well designed study that followed sound procedures for data collection and analysis. The use of factor analysis was appropriate and well described in the text. Instrumentation and data analysis strategies were sound, and findings were clearly stated. The authors concluded that "…three factors underlie faculty perceptions of academic rigor," yet these three factors explained 56-60% of the variance in faculty perceptions, leaving another 40-44% unexplained. The authors seemed to imply a cause/effect relationship between a rigorous academic environment and the three factors found to partially explain faculty perceptions of rigor.

Relationships Between Instructional Method And Critical Thinking In A Turfgrass Management Course

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INTRODUCTION

The use of computers in undergraduate education has become common. At present, computers in education are primarily used for word processing, record keeping, programming, database and spreadsheet applications and communication, rather than delivering instruction per se (Becker, 1991). Although computer-aided instruction (CAI) has been used since the advent of the personal computer and before, it is still far from commonplace.

Recent software developments have made it relatively easy for instructors and other content experts to develop their own CAI. Much of the new software requires no programming knowledge. In addition to new non-programming software, there is HyperCard (Miller, 1993) and HyperCard-like shareware available that is easily modified by instructors with a minimal amount of expertise (McDonough, Strivens, and Rada, 1994). Although many studies have tested the efficacy of CAI, and compared CAI to traditional instruction, it has not always apparent how those studies relate to what can be practically accomplished in the typical classroom. (Maddux, 1995).

A large selection of commercial software is available for primary and secondary education, but very little is produced for college-level education. Many instructors like to design their own lessons within a subject area, and most CAI at the college level is instructor produced (Gardner, 1990).

With broad availability of computers for student use and increasing ease of writing instruction for the computer, many instructors create instruction for the computer without adequate knowledge of how effective their efforts will be. There is a need for educators in agricultural sciences to have locally produced and tested models of CAI.

Research on the Effectiveness of CAI

There are been several meta-analyses providing summaries of research on the effectiveness of CAI. A study by Kulik, Kulik and Cohen (1980), determined that on average in 59 independent studies, CAI raised the examination scores of students by .25 standard deviations. This is a small but significant contribution when considered over a large number of studies. The scores of students receiving instruction by CAI were about three percentage points higher than the scores of those receiving traditional instruction. The typical student in a CAI class scored at the 60th percentile, while a student receiving instruction in a traditional class scored at the 50th percentile.

A meta-analysis by Walberg, (1984) involving many different instructional interventions – "Improving the Productivity of America's Schools" was reviewed by Gall (1996). The study showed CAI to have an "effect size" of .24, raising the scores of students from the 50 percentile to the 59th percentile. According to Gall (1996), "Researchers consider effect sizes larger than .33 to have practical significance, that is, the effect of the intervention is large enough to make a worthwhile difference in the outcome that was measured".

By the end of the 1980s, some researchers began to question the internal and external validity of many earlier studies on the effectiveness of CAI. Gerald Bracey (1989) noted that in a recent review of research, only two of 224 CAI studies used microcomputers in actual classroom situations. The rest were done using mainframes or minicomputers in specialized settings.

Bracey also noted a report of a careful investigation of 51 CAI studies which claimed 34 of them had serious methodological flaws.

With criticisms of recent research and meta-analyses in mind, Fletcher-Flinn and Gravatt (1995) conducted a meta-analysis of 120 recent studies of effectiveness of CAI. All studies were well described and fit the criteria for good internal and external validity. The effect size for CAI studies conducted from 1987 to 1992 was .24, and the effect size for more recent studies was .33. Those effect sizes are comparable to past syntheses and raised the average student from the 50th to the 60th percentile. Tutorial/ drill and practice CAI comprised the largest category of the studies in the Fletcher-Flinn and Gravatt study. Forty-eight of 120 studies involved college level instruction. An interesting result of that study, in light of this study, was that paper and pencil versions of the CAI had an effect size of .08, or essentially a negligible effect in raising scores when compared with traditional instruction. In a single study by Shute and Gawlick-Grendell (1994) comparing a CAI module in statistics and a paper and pencil workbook version of the CAI module, the CAI group scored significantly higher on the posttest than the workbook group.

Attitudes Toward Instructional Method

The meta-analysis by Fletcher-Flinn and Gravatt (1995) found that students had extremely positive attitudes about CAI and also felt more favorably toward the subject matter. Shute and Gawlick-Grendell (1994) concluded from their study that when instructional content and style are held constant, CAI is more motivating and enjoyable, making the material more memorable.

Critical Thinking

Critical thinking can be defined in different ways for different purposes and perhaps an exact definition is impossible. "Teachers are being asked to develop more than basic skills in their classrooms. The variety of labels for these new goals—higher order thinking, critical thinking, problem solving, rational thought and reasoning—are confusing" (Lewis and Smith, 1993). Jonassen (1996) summarizes the idea of critical thinking most closely related to and used in this study – "Critical thinking involves the dynamic reorganization of knowledge in meaningful and useful ways. It involves three general skills: evaluating, analyzing and connecting."

Critical thinking is the component that is needed to go beyond the information given, and apply that information in practical and problem-solving situations. Good critical thinking skills enable doctors to make accurate diagnoses, and engineers to design bridges and buildings that won't collapse under normal use. Our level of critical thinking determines how effectively we put knowledge or information to use.

Critical Thinking and Computers

The act of using a computer will not in itself increase critical thinking. There are basically two ways computers can be used to enhance critical thinking. The first is by using programs specifically designed to teach and improve thinking skills. The second is by using existing computer applications in ways that allow students to use their existing thinking skills to look at the information presented in a way that facilitates critical thinking within the subject area (Cannings and Brown, 1986; Jonassen, 1996).

Using computers as "tools" for enhancing critical thinking has been advocated and studied. Jonassen (1996) urges learning with computers rather than from computers and calls computers used in that fashion, "Mindtools." Utilizing databases, spreadsheets, hypertext, expert systems, semantic networking, computer networking, micro worlds and even word processing software have been shown to enhance or facilitate critical thinking skills. Jonassen contends that "...students cannot use these tools without thinking deeply about the content they are learning...often require learners to think harder about the subject-matter domain being studied than they would have to think without the Mindtool...using Mindtools necessarily engages the learners in reflective thinking, which leads to knowledge construction." In order for a student to think critically within a subject domain, obviously factual subject-matter knowledge must first be obtained.

In general, as knowledge of a subject goes up, so does problem solving ability within that subject domain. One of the ways certain applications can enhance critical thinking skills is by showing relationships, making connections, comparisons, showing cause and effect; by providing a different way of looking at factual knowledge. The result of enhanced critical thinking within a subject domain would be students who have a better overall picture of the subject matter, but not necessarily a higher level of factual knowledge.

PURPOSE AND OBJECTIVES

The overall purpose of this study was to determine if there was a relationship between instructional method and critical thinking involving the subject matter.

1. Determine if there would be difference in test scores of factual knowledge between two experimental groups and a comparison or control group using a traditional instructional technique, namely a slide show tutorial.

2. Determine if the instructional method in this lesson had an influence on a subset of "critical thinking" questions that asked the students to relate the information they had learned to a new situation.

3. Determine if instructional method had an influence on the attitudes of students toward the instruction.

METHODS AND PROCEDURES

Population

The population of the study was the Fall Semester Turf 235 class in 1996. The class consisted of two 50 minute lectures per week and one fifty minute lab period. Turf 235 is the introductory turfgrass management course for the four-year turf program. The class had 168 students in 1996. There were 15 four-year Turfgrass Science majors in the class. The majority of the students were in the Landscape Contracting major. Turf 235 is a requirement for that major and is used as an elective for several other majors.

Experimental Design

The experimental design used in this study was Quasi-experimental, non-equivalent control group, pretest posttest (Campbell and Stanley, 1963). Students chose lab sections at registration. Each lab section was assigned a method of instruction, primarily based on the availability of a computer lab for demonstrating use of one of the methods.

Treatments

A single lesson in the course, involving turfgrass seed identification and characterization, was chosen for this study because the information was not in their textbook. A pretest to determine turfgrass seed knowledge was given during the first meeting of each lab section. The students had no access to study materials till they were assigned a method of instruction. Two weeks after the pretest, the students were assigned a method of instruction in their regular lab period. There were eight lab sections, four on Monday and four on Wednesday. All students were given two weeks to study the material. Each section was given clear instructions for completing the lesson. All students were given clear objectives for the lesson. They were told what they would be tested on, and informed that the posttest would count toward their course grade. Although the seed lesson had been taught in previous years using the slide show instruction method, students in past years had not been tested thoroughly on the seed material. Therefore, there were no existing tests available to the students. The students were informed of the nature of the research study.

All students within each lab section received the same method of instruction. One group was to be given an expert system shell and would have received instruction from the World Wide Web. Those students would have taken the information they found on the Web site and used it to build an expert system designed to identify grass seeds. Unfortunately, the server in the computer lab was not functioning on the day scheduled for training and that method of instruction was dropped from the study. Those two lab sections were assigned one of the other three methods. Ultimately, two sections were assigned slide show instruction. Three sections were assigned computer-aided instruction and three sections were assigned print-based instruction.

Slide Show Instruction

The slide show is comprised of 57 color slides and has an accompanying handout that contains the narrative and worksheets. The students received the handout in lab and were directed to the Ag Learning Center where the slides are kept. The Ag learning center is in the same building the labs were held.

Computer-Aided Instruction (CAI)

The computer-aided instruction that was developed for the seed lesson is comparable to Hypercard or Toolbook (Milheim, 1994). The actual software used was Oracle Media Objects by Oracle Corporation. The lesson was available at 11 of the computer labs on campus. There was no accompanying handout other than a brief set of directions on how to use the lesson. There was also no way to print the material from the computer. The students were told they should be prepared to take notes. All slides from the slide show instruction were scanned at high quality and incorporated into the computer tutorial. The computer module was very similar in some ways to the slide show, with the exception that the images had narrative directly below on the computer screen. Scrolling text boxes were used when needed. The screens of the computer module were in the same order as the those in the slide show, but the students could move to any section in the computer module. Each section in the computer module had an interactive quiz at the end. The users could go the quiz at any time, or from the quiz back to the lesson. If the student gave an incorrect answer to a quiz question twice in a row, they were given a review and asked the question again. If they missed the question a third time, they were provided the correct answer. They also had the option to proceed through the lesson without taking any quizzes. The students could return to use the module as many times as they wished.

Print-Based Instruction (PBI)

The print-based instruction handout was printed from the Web instruction that was not used and was modified only to facilitate printing. It contained all the images that were in the computer exercise and the narrative was identical. The handout was printed in black and white as the color in the other two versions was not actually needed to complete the objectives of the lesson. There were no quizzes or worksheet exercises in the print-based instruction.

Data Collection and Analysis

In all cases, the tests forms were collected from the students to prevent them from passing information to students in later lab periods. The students coded their answers onto standard computerized answer sheets and the tests were graded by the University Testing Services. All tests were multiple choice. The tests did not require the identification of images of the seeds. The lesson objectives specified the learning of verbal information for identification of specific seeds.

Pretest

A pretest to determine turfgrass seed knowledge was given during the first meeting of each lab section and consisted of 20 questions. The students were told at the time that the test would not count toward their grade. They were informed that it was part of a research study. The students did not have access to any instructional material between the pretest and the time they were assigned a method of instruction.

Posttest

The posttest was given two weeks after the students were assigned the instruction method. The posttest was comprised of three parts:

- Posttest Part I was identical to the Pretest.

- Posttest Part II questions were similar to Posttest Part I questions and tested the same material, but were not used on the pretest.

- Critical Thinking Test (consisted of four questions). The critical thinking questions asked the students to imagine a newly developed grass that had an unusual seed. The characteristics of that new seed were described, and the students were asked to decide what genus the new seed would most likely belong to. The students were also asked to report whether they had used the instructional method they were assigned, and if they had used more than one instructional method.

Attitude Survey

Fifteen statements were chosen from the Instructional Materials Motivation Scale survey created by Keller (1987) to assess how the students felt about the different methods of instruction. His ARCS model looks at the areas of attention, relevance, confidence and satisfaction. The survey was implemented the last lab session of the course. Participation was voluntary and the students were not required to identify themselves. Students who reported using a combination of the instructional methods to study the seed lesson were not included in the analysis.

One-way ANOVA was used to compare means of test scores and attitude survey ratings of the different groups. For means that showed significant differences, Fisher's pairwise comparison was used to determine how any two groups compared. Correlations were run to determine relationships between different tests and sections of tests within each group. The test score data had normal distributions with exception of critical thinking section of posttest. That section of the posttest contained only four questions. Score distributions for the critical thinking test for all groups were positively skewed.

Only students who took both the pretest and the posttest were included in the study. Any students reporting that they used more than one instructional technique were not included in the study. As a result of this procedure, 130 students of 168 enrolled in the class were included in this study.

FINDINGS

Pretest

No significant differences were found for the three groups receiving different methods of instruction; F=.74, p=.480. Theoretically, the scores could range from 0 to 100%. The means of the scores on the pretest for the three groups varied from a high of 44.49% for the slide show group to 41.52% for the CAI group, and the print-based group had a mean of 43.86%.

Table 1. Mean, Standard Deviation and Range for Pretest scores by Method of Instruction.

Method of Instruction	n	Pretest Mean (%)	Standard Deviation	Range (%) Low	Range (%) High
Slide Show	39	44.49	12.71	25.00	75.00
CAI Tutorial	56	41.52	11.67	20.00	85.00
Print-based	35	43.86	13.88	20.00	80.00

Objective 1 – Posttest of Factual Knowledge

The Posttest consisted of three parts:

- Posttest Part I was identical to the Pretest.
- Posttest Part II questions were similar to Posttest Part I questions and tested the same material, but were not used on the pretest.
- Critical Thinking Test (four questions).

Overall Posttest scores (all parts combined), did not differ significantly for the three groups receiving different methods of instruction; F=2.47, p=.089 (Table 2).

Posttest Part I (identical to pretest) scores did not differ significantly for the three groups receiving different methods of instruction; F=.34, p=.0.711 (Table 2).

Posttest Part II (new questions – does not include Critical Thinking Test questions) scores did not differ significantly for the three groups receiving different methods of instruction; F=2.12 p=.0.124 (Table 2).

Table 2. Mean of Overall Posttest (all parts), Posttest Part I (identical to pretest) and Posttest Part II (new questions) by Method of Instruction.

Method of Instruction	n	Overall Posttest Mean (all parts)	Posttest Part I Mean (identical to Pretest)	Posttest Part II Mean (new questions)
Slide Show	39	66.47	81.03	60.24
CAI Tutorial	56	72.63	82.50	68.34
Print-based	35	71.64	82.95	66.36

Objective 2 – Critical Thinking Test

Critical thinking test scores differed significantly for the three groups receiving different methods of instruction (Table 3). The CAI group scored significantly higher on the Critical Thinking Test than the slide show group.

Table 3. Mean, Standard Deviation and ANOVA Results of score on Critical Thinking Test section of Posttest (four questions).

Method of Instruction	n	Critical Thinking Mean score (correct out of 4)	Standard Deviation	Range (correct out of 4) Low	High
Slide Show	39	0.82a*	1.12	0	3
CAI Tutorial	56	1.57b	1.46	0	4
Print-based	35	1.37ab	1.53	0	4

* Means followed by the same letter are not significantly different from each other at the .05 alpha level (F=3.43, p=.035) as computed by Fisher's pairwise comparison.

Relationships Between the Scores of Posttest Part I+II and the Scores of the Critical Thinking Test

Table 4 contains the Pearson product-moment correlation coefficients calculated to describe the relationships between the scores on Posttest Part I+II (combined) and the Critical Thinking Test for the three groups receiving different methods of instruction.

There was a positive moderate relationship significant at the .05 level, between the scores of Posttest Part I+II and the Critical Thinking Test for the CAI group (r=.483) and between scores of Posttest Part I+II and the Critical Thinking Test for the PBI group (r=.464). Low relationship significant at the .05 level existed between scores of Posttest Part I+II and the Critical Thinking Test for the slide show group (r=.263). This suggests that those who did score high on the posttest in the slide show group did not score as high on the Critical Thinking Test relative to those who scored high on the posttest in the CAI and PBI groups.

Table 4. Relationship between Means of scores of Posttest Part I+II and Scores of Critical Thinking Test.

Method of Instruction	n	Posttest Part I+II Mean %	Critical Thinking Test Mean (correct of 4)	Pearson Product-moment Correlation Coefficient
Slide Show	39	70.87	0.821	0.263*
CAI Tutorial	56	75.58	1.571	0.483*
Print-based	35	75.04	1.371	0.464*

*p < .05

Objective 3 – Attitude Survey

Fifteen statements were chosen from the Instructional Materials Motivation Scale survey created by Keller (1987) to assess how the students felt about the different methods of instruction. His ARCS model looks at the areas of attention, relevance, confidence and satisfaction. For each statement, the responses could range from one to five. A response of one indicated the lowest level of agreement and five indicated the highest level of agreement with the statement.

As shown in Table 5, significant differences were found between CAI, PBI and slide show groups relative to attention and satisfaction areas of the attitude survey. For both those areas, the CAI group scored significantly higher than slide show group. However, the three groups did not significantly differ regarding the relevance and confidence areas of the attitude survey (Table 5).

Table 5. Means and ANOVA Results of answers to Attitude Survey for each category by Method of Instruction.

Instruction	Attention	Relevance	Confidence	Satisfaction
Slide Show	2.57a*	3.19	3.13	2.66a**
CAI	3.44b	3.28	3.28	3.32b
Print-based	3.15ab	3.45	3.43	3.00ab

* Means followed by the same letter are not significantly different from each other at the .05 alpha level as computed by Fisher's pairwise comparison.
** Means followed by the same letter are not significantly different from each other at the .10 alpha level as computed by Fisher's pairwise comparison.

CONCLUSIONS AND RECOMMENDATIONS

There was no significant difference between the means of the Overall Posttest (Parts I+II+Critical thinking test) scores of turfgrass seed knowledge for the three groups receiving different methods of instruction. That there was very little difference in the scores on Posttest Part I (identical to pretest), while there was a difference in the Overall Posttest scores at the p<.10 level indicates there was a test effect or learning effect from the pretest. One of the possible reasons both the CAI and the PBI group performed better on the posttest than the slide show group was the use of bold style type to highlight important terms in the CAI and PBI.

The print-based instruction group in this study scored almost as well on the posttest as the CAI group. This is contrary to the findings of some previous studies (Shute and Gawlick-Grendell, 1994; Fletcher-Flinn and Gravatt, 1995). A variable that was not considered in this study, and one of the possible reasons the PBI group scored almost as well as the CAI group, was study time. The CAI group had to go to a computer lab to study, whereas the PBI group had the convenience of being able to carry their material with them and study at any time. They could review the material right up to the time of the posttest. As noted earlier, the CAI group could not print the material from the computers. They had to rely on taking notes and the use of the interactive quizzes.

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The Critical Thinking Test, although not a test of problem solving, tested some of the components of critical thinking such as ability to analyze and make connections, when applying the factual knowledge and concepts to a new situation. For those who scored 80 or above on Posttest Part I+II, the average Critical Thinking Test score was 1.5 out of four for those in the Slide Show Instruction group. For those in the CAI and print-based group scoring 80 and above in Posttest Part I+II, the average Critical Thinking Test score was 2.5. Students using CAI and also those using print-based instruction in this study, scored higher in a test of "critical thinking" that involved applying factual knowledge to a new situation, most likely indicates that the material was better organized, providing a better overall picture of the material, and those groups had a better idea of how the different categories of seeds could be distinguished by their characteristics, beyond memorization. Therefore, it is suggested that information to be learned can be presented in ways that provide a different view of that material and facilitate increased levels of critical thinking within that subject domain.

The results of the attitude survey used in this study agree with those of other studies (Shute and Gawlick-Grendell, 1994; Fletcher-Flinn and Gravatt, 1995) showing more positive attitudes toward CAI.

The following recommendations are made based on findings and conclusions of the study.

1. More in-depth studies of the relationship of CAI efficacy, learner attitudes and critical thinking should be undertaken.

2. Studies where print-based versions of CAI offered no advantage over traditional instruction should be considered when designing print-based instruction.

3. The production print-based instructional materials is considerably quicker and less expensive than CAI. Studies of the efficacy of combinations of CAI and print-based materials should be undertaken.

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Relationships Between Instructional Method And Critical Thinking In A Turfgrass Management Course

A Critique

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This research addresses what has become a frustrating area of inquiry in teaching and learning. While everyone seems to embrace the notion that computers will clearly boost learning and achievement, convincing evidence to support that expectation does not exist. Computers continue to be used more and more for managing the teaching/learning process, but bona-fide instructional uses of computers remain relatively limited. The need to verify the value and effectiveness of instructor and commercially developed CAI software is great - computers are destined to become more influential in education. The authors noted the uniquely short life span of research on CAI, due to the ever-changing capacity and design of computers and supporting software.

These researchers have chosen a very timely topic and attempted an intriguing and challenging study on CAI. Unfortunately, the study has several weaknesses which limit our ability to take action based upon the outcomes presented. The trouble spots include the conceptual model, instrumentation, treatment format, and data analysis. The study should be couched within a conceptual model that presents the theoretical connections between major variables in the teaching/learning process, emphasizing those variables addressed in this study. The authors also seemed to struggle with a clear definition of critical thinking. (The one presented in the paper is debatable and incomplete.)

Several questions pertaining to research procedures and instrumentation need attention. Were treatments randomly assigned to lab groups? Why was seed identification (a lower level cognitive skill) chosen for the instructional topic? Could student knowledge of the study have influenced the outcomes? What teaching methods were used in the study? I would suggest that only one teaching method (independent study) and three learning tools or resources were used. What was the validity and reliability of the instruments? What four questions comprised the critical thinking test? Why wasn't a recognized test of critical thinking skills used? Why was Posttest Part I identical to the Pretest? Did the researchers consider using MANOVA for data analysis? This would have allowed simultaneous analysis of the dependent variables and reduced the probability of committing a Type I error. The above questions make it difficult to draw significant conclusions and recommendations from the study. Finally, the authors suggest that higher critical thinking scores were due to better organization of the subject matter in the CAI and print-based instruction groups. A more complete consideration of this relationship should be explored.

The Effects Of World Wide Web Instruction And Traditional Instruction And Learning Styles On Achievement And Changes In Student Attitudes In A Technical Writing In Agricommunication Course

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INTRODUCTION

The use of educational technologies such as computers and telecommunications offers great potential for improving the delivery of already high quality instructional programs (McCaslin and Torres, 1992). "The Internet and in particular the World Wide Web (WWW) promise to be some of the most powerful classroom tools available," (NVATA, 1995). A multimedia/ hypermedia part of the Internet, the WWW brings a graphical user interface to world wide networking by allowing full integration of color graphics, text of varying typefaces, animation, video and sound (Seguin & Seguin, 1995). The WWW can be viewed with browser programs such as Netscape Navigator® (NVATA, 1995). The main feature these browsers provide is a user-friendly approach to surfing the "information superhighway" with a simple point and click of the mouse.

According to Marrison and Frick (1994), "Multimedia is a multi-faceted approach to computer-based education that brings together text, animation, graphics, video, and audio" (p. 26). Hypermedia is the next generation of multimedia. Liu (1994) identified four advantages of hypermedia: nonlinearness, associatively, flexibility, and efficiency. Hypermedia-based instruction differs from traditional instruction, because there is no specific sequence for proceeding from one point to another (Liu, 1994). Because of this capacity and the ability to present information through text, graphics, audio, and video, hypermedia holds much potential for optimizing learning (Liu, 1994).

Numerous universities throughout the country have on-line classes, with the number of hypermedia-based course materials and lessons being placed on home pages increasing (Raven & Settle, 1995). These classes provide students with a supplement to the classroom experience in the form of a class website. Students are able to access assignments, reading materials, quizzes, videos, graphics, audio, slide presentations, and other useful information. In agriculture, however, very few professors have courses on-line at the present time (Newman, Terry, & Raven, 1995).

Mississippi State University's Department of Agricultural Education and Experimental Statistics currently has nine classes with on-line resources. Each course uses the WWW differently for instruction. Of the nine, only one is classified as "Web-dependent", AEE 3203 - Technical Writing in Agricommunication (Oregon State University, 1996).

Because the WWW is such a new medium, little information exists on the effectiveness of courses taught using the Web. Some possible benefits include improving students' computer abilities and information processing abilities, providing students with teachers' lecture materials, and providing students with links to related information so they can study the subject matter in more depth (Newman, Raven, & Day, 1995; Newman, Terry, & Raven, 1995).

Student Achievement and Attitudes

In a study of computer-aided learning using the WWW, Goldberg (1996) found that students who were taught using traditional lecture and the WWW performed better than two other groups who were taught with either traditional lecture or the WWW. In an experimental study of computer-assisted instruction in mathematics, Ganguli (1992) found that the CAI instruction group experienced higher enjoyment, more motivation, and better understanding of the concepts in the course. In a college chemistry course, subjects taught using a computer simulation scored better than students taught using the traditional lecture method and the learning cycle method (Jackman, Moellenberg, & Brabson, 1987).

Researchers have differed in their findings, however, when studying student attitudes toward the computer as an instructional tool. Some researchers have found that giving students the opportunity to use computers in instruction increases their attitudes toward using the computer (Kinzie, Delcourt, & Powers, 1994; Busch, 1995). Other researchers have concluded that students' attitudes may either increase or decrease with more experience (Weil, Rosen, & Wugalter, 1990; Campbell & Williams, 1990).

Learning Styles

Numerous studies in agricultural education have used the Group Embedded Figures Test (GEFT) to measure learning styles. However, except for a few, most of the learning styles research conducted in agricultural education has been exploratory and has not considered the impact of students' learning styles on teaching and learning. Marrison and Frick (1994) determined that learning styles had no significant effect on students' overall achievement or students' perceptions of lecture versus multimedia instruction. Cano, Garton, and Raven (1992) determined that a positive, statistically-significant relationship existed between learning styles and performance in a Methods of Teaching Agriculture course. Cano and Garton (1994) found that learning styles had an effect on microteaching scores and final grades in a methods course.

Statement of the Problem

The purpose of this study was to determine the effects of web-dependent instruction on student achievement and attitudes in a technical writing in agricommunication course, while also considering the effects of learning style and the interaction of learning style and method of instruction. The following research hypotheses were tested at the *a priori* level of .05:

H-1: Students in AEE 3203 - Technical Writing in Agricommunication taught using Web-dependent instruction with a laboratory will have higher group means than those taught using traditional instruction on selected assignments.

H-2: Students in AEE 3203 - Technical Writing in Agricommunication who are field-independent according to the Group Embedded Figures Test will have a higher group mean than those who are field-dependent on selected assignments.

H-3: An interaction between learning style and method of instruction will be observed when means for subject subgroups are compared on selected assignments.

H-4: Students in AEE 3203 - Technical Writing in Agricommunication taught using Web-dependent instruction with a laboratory will have higher mean increases on selected attitude scales than those taught using traditional instruction.

H-5: Students in AEE 3203 - Technical Writing in Agricommunication who are field independent according to the Group Embedded Figures Test will have higher mean increases on selected attitude scales than those who are field-dependent.

H-6: An interaction between learning style and method of instruction will be observed when means increases on selected attitude scales for subject subgroups are compared.

METHODOLOGY

Research Design. To determine the effects of method of instruction on students' achievement, a posttest-only experimental design was used. To determine the change in student attitudes, a pretest-posttest experimental design was used.

Population & Sampling. The population of the study consisted of 58 undergraduate students at Mississippi State University enrolled in AEE 3203, Technical Writing in Agricommunication during Fall semester, 1995. AEE 3203 is a technical writing course for juniors and seniors in the College of Agriculture and Life Sciences. Although class size is typically limited to 28 students, 58 students were allowed to register for Section 2 of the class. Prior to the first day of class, students were randomly assigned to one of two groups, A or B. The treatment level was then randomly assigned to the groups. Group A was assigned to the traditional course. Group B was assigned to the WWW course. Each group had 29 students. One student from Group B withdrew from the university during the semester.

Description of Treatments. Students in Group A received a traditional, 3-credit-hour course. Students attended class three times per week for 50 minutes each class session. Students purchased a textbook and a course packet of handout materials. The chalkboard and overhead transparencies were primarily used in instruction. Each student completed seven major assignments for the class: a review of a journal article, a memorandum, a business letter, a letter of application, a press release, a technical report, and an oral presentation about the technical report. A midterm and final examination also were given.

Students in Group B participated in a "Web-dependent class" (Oregon State University, 1996). Students in this class attended two 50-minute class sessions each week (on Monday and Wednesday) and one 50-minute laboratory each week (on Friday). Computer-generated slides using a computer, overhead projector, and LCD display panel were the primary media used for instruction. The laboratory activities consisted of assignments based on each week's class sessions which the students completed in a computer laboratory under the supervision of the course instructor. Students could turn in these assignments using electronic mail. Students were required to purchased the course textbook but not the handout materials, which were located on the WWW. All supplemental course materials, including regular and laboratory assignments, were provided on the AEE 3203 website. In addition, all of the computer-generated slides used in the class sessions were available to students via the AEE 3203 home page. Students were required to complete the same seven major assignments as Group A. They also took the same midterm and final examination.

Instrumentation. Two application questions on the midterm examination were used as one measure of students' achievement. The questions were developed by six instructors who teach different sections of the course. One question involved writing a memorandum. The other involved editing a business letter. Content validity of the measurement is assumed because the two questions reflected the overall objectives of the course. The midterm examinations were pooled and graded by a graduate assistant to control for inter-rater reliability and experimenter effect. The graduate assistant was provided a scoring key by the researchers.

The other measure of student achievement was the major class project, a technical report. Each technical report was graded by three evaluators using a standardized rating scale that incorporated the criteria presented in class and in the text. A graduate assistant graded 10 technical reports from each class to determine inter-rater reliability. For Group B, the Web-dependent course, the graduate assistant and instructor had an inter-rater reliability above 95% (within plus/minus 5%). Therefore, the instructor's grades were used. For Group A, the traditional class, the graduate assistant had a low inter-rater reliability of below 70%. Therefore, the graduate assistant re-graded all of the technical reports for Group A.

Semantic differential instruments were developed to measure the attitudes of the students toward computers, writing, the Internet, and learning about writing. Each instrument contained 10 sets of bipolar adjectives with a seven-space scale for students to indicate where their feelings existed. All four instruments contained the same 10 sets of adjectives. Reliability estimates for the semantic differential instruments were obtained through the use of a pilot test during a Summer 1995 session of AEE 3203. Obtained reliability estimates were as follows: computers - $r = .96$, writing - $r = .81$, the Internet - $r = .84$, and learning about writing - $r = .87$. Although the groups were assigned randomly, group sizes was a concern ($N = 57$). Therefore, student attitudes were measured on the first day of class and the last day of class, with gain scores used as the dependent variables for hypotheses 4, 5 and 6.

The Group Embedded Figures Test (GEFT) was used to determine preferred learning styles, either as field-dependent or field-independent. Individuals scoring greater than the national mean (11.4) were classified as field-independent learners, while those scoring less than the national mean were considered to a prefer field-dependent learning style (Witkin et al., 1971). Internal consistency was measured by treating each scored section (sections two and three) as spilt halves. Witkin et al. (1971) reported a Spearman-Brown reliability coefficient of .82 on the GEFT.

Statistical Analysis. For the purpose of statistical analysis, the researchers treated the students in the study as a sample of possible students who might enroll in the course (Allen, Abaye, McKenna, & Camp, 1995). Based on this approach, inferential statistics were used in the analysis. To reduce the family-wise error rate for the null hypotheses, a multivariate analysis of variance was used to determine if the students were different based on teaching method and learning style.

FINDINGS

Effects of Method of Instruction and Learning Style on Achievement

To avoid having a large family-wise error rate, hypotheses 1, 2, and 3 were tested using a factorial MANOVA. Table 1 contains a summary of the MANOVA. Follow-up analyses were conducted where a significance was found.

Table 1. Summary of MANOVA Analysis for Achievement (n=53)

Variable	df	Wilks' Lambda	F	p
Type of Instruction	1	.731	8.841	.001
Learning Style	1	.951	1.237	.299
Interaction	1	.998	.005	.995

Hypothesis 1. The first null hypothesis, that of no significant difference between type of instruction on students' achievement, was tested using multivariate analysis of variance (MANOVA). The MANOVA yielded a Wilks' lambda of .731 for an $F(1,50) = 8.841$ which was significant at the *a priori* alpha level of .05 ($p \leq .001$). The results from the MANOVA are given in Table 1. Table 2 contains the mean for each class on the midterm examination and technical report. Group A, the traditional group, had a mean of 27.54 out of a possible 50.00 on the two questions of the midterm. Group B, the WWW group, had a mean of 30.81. On the technical report, Group A had a mean of 184.79 out of a possible 250.00. Group B had a mean of 212.08.

Table 2. Group Means of Midterm Examination and Technical Report by Type of Instruction

Group	Mean Midterm	n	SD	Mean Technical Report	n	SD
A - Traditional	27.54	28	5.29	184.79	28	21.40
B - World Wide Web	30.81	27	6.72	212.08	26	26.85
Total	29.15	55	6.20	197.93	54	27.62

Univariate F-tests revealed differences between the two groups on the two dependent variables. The results of the tests are given in Table 3. Means for the groups on the two dependent variables given in Table 2 show that the Group B, the WWW group, scored higher on both dependent variables. The null hypothesis was rejected and the research hypothesis was retained.

Table 3. Summary of Univariate F Tests from the MANOVA Analysis for Section

	Hypothesis MS	Error MS	F	p
Midterm Exam	266.13	25.21	10.56	.002
Technical Report	9446.72	602.76	15.67	<.001

Hypothesis 2. The second null hypothesis, that of no significant difference between learning style and achievement, was tested using multivariate analysis of variance (MANOVA). The MANOVA yielded a Wilks' lambda of .951 for an approximate F(1,50) = 1.237 which was not significant at the *a priori* alpha level of .05 (p = .299). The results from the MANOVA are given in Table 1. Therefore, the null hypothesis was retained and the research hypothesis was rejected. Table 4 contains the means for each class on the midterm exam and technical report. Group A, field-independent, had a mean of 30.12 out of a possible 50.00 on the two questions of the midterm. Group B, field-dependent, had a mean of 29.10. On the technical report, Group A had a mean of 193.96 out of a possible 250.00. Group B had a mean of 200.43.

Table 4. Group Means of Midterm Examination and Technical Report by Learning Style

Group	Mean Midterm	n	SD	Mean Technical Report	n	SD
A - Field-independent	30.12	25	4.94	193.96	25	30.98
B - Field-dependent	29.10	29	5.78	200.43	28	24.33
Total	29.57	54	5.38	197.38	53	27.59

Hypothesis 3. The third null hypothesis, that of no interaction between type of instruction and learning style on achievement, was tested using multivariate analysis of variance (MANOVA). The MANOVA yielded a Wilks' lambda of .998 for an approximate F(1,50) = .995 which was not significant at the *a priori* alpha level of .05 (p = .995). The results from the MANOVA are given in Table 1. Therefore, the null hypothesis was retained and the research hypothesis was rejected. Group means by type of instruction are given in Table 2. Table 4 supplies the group means by learning style.

Effects of Method of Instruction and Learning Style on Attitudes

To avoid a large family-wise error rate, hypotheses 4, 5, and 6 were tested using a factorial MANOVA. Table 5 contains a summary of the MANOVA. Follow up analyses were conducted where a significance was found.

Table 5. Summary of MANOVA Analysis for Attitudes (n=53)

Variable	df	Wilks' Lambda	F	P
Type of Instruction	1	.793	3.06	.025
Learning Style	1	.991	.10	.981
Interaction	1	.883	1.54	.205

Hypothesis 4. The fourth null hypothesis, that of no significant difference among type of instruction and attitudes toward computers, learning about writing, the Internet, and writing, was tested using multivariate analysis of variance (MANOVA). The MANOVA revealed a statistically significant difference between the two groups. The MANOVA yielded a Wilks' lambda of .793 for an approximate $F(1,50) = 3.06$ which was significant at the *a priori* alpha level of .05 ($p \leq .025$). The results from the MANOVA are given in Table 5. For the attitude scales of learning about writing, the Internet, and writing, the WWW group had a higher mean gain than the traditional group. The traditional group had a higher mean gain on attitude scale of computers. Table 6 contains a summary of the mean gains. Univariate F-tests revealed that the group means for one scale, writing, were significantly different. The results of the tests are given in Table 7.

Table 6. Means of Attitudes for Computers, Learning about Writing, Internet, and Writing by Type of Instruction (n=52)

	Pretest	Posttest	Gain
Computer			
A - Traditional	48.33	48.92	.59
B - World Wide Web	50.40	49.80	-.60
Learning about Writing			
A - Traditional	47.67	46.67	-1.00
B - World Wide Web	46.16	47.04	.88
The Internet			
A - Traditional	43.41	46.67	3.26
B - World Wide Web	41.44	53.08	11.64
Writing			
A - Traditional	46.70	45.81	-.89
B - World Wide Web	41.40	46.56	5.16

Table 7. Summary of Univariate F Tests from the MANOVA Analysis

	Hypothesis MS	Error MS	F	p
Computers	14.69	120.30	.12	.728
Learning about Writing	38.00	79.14	.48	.492
The Internet	776.82	209.04	3.72	.060
Writing	460.60	67.79	6.79	.012

Hypothesis 5. The fifth null hypothesis, that of no significant difference between learning style and attitudes, was tested using multivariate analysis of variance (MANOVA). The MANOVA yielded a Wilk's lambda of .991 for an approximate F(1, 50) = .102 which was not significant at the *a priori* alpha level of .05 (p = .981). The results from the MANOVA are given in Table 5. Therefore, the null hypothesis was retained and the research hypothesis was rejected. Table 8 contains the means for learning style on each attitude scale. Group A, field-independent, had higher mean gains on the scales of computers and the Internet. Group B, field-dependent, had higher group mean gains on the scales of learning about writing and writing.

Table 8. Means of Attitudes for Computers, Learning about Writing, Internet, and Writing by Learning Style (n=52)

	Pretest	Posttest	Gain
Computer			
A - Field-independent	51.48	51.52	.04
B - Field-dependent	47.33	47.33	.00
Learning about Writing			
A - Field-independent	48.36	47.92	-.44
B - Field-dependent	45.63	45.85	.22
The Internet			
A - Field-independent	44.64	53.12	8.48
B - Field-dependent	40.44	46.63	6.19
Writing			
A - Field-independent	46.24	48.16	1.92
B - Field-dependent	42.22	44.33	2.11

Hypothesis 6. The sixth null hypothesis, that of no interaction between type of instruction and learning style on the attitude scales on computers, learning about writing, the Internet, and writing, was tested using multivariate analysis of variance (MANOVA). The MANOVA yielded a Wilks' lambda of .883 for an approximate F(1, 50) = 1.54 which was not significant at the *a priori* alpha level of .05 (p = .205). The results from the MANOVA are given in Table 5. Therefore, the null hypothesis was retained and the research hypothesis was rejected. Group means by type of instruction are given in Table 6. Table 8 supplies the group means by learning style.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The following conclusions are drawn from the findings of the study:

1. Students who were taught using the WWW with a laboratory achieved at a higher level than those students who were taught using the traditional classroom approach.
2. Using the combination of WWW-dependent instruction with a practical laboratory was a better method of teaching students technical writing than a traditional classroom approach.
3. Teaching using the WWW with a laboratory improved students' attitudes toward writing and did not harm their attitudes toward computers, the Internet, and learning about writing.
4. Learning styles had no effect on student achievement or attitudes in Web-dependent instruction or in traditional instruction of AEE 3203.
5. Interaction effects did not occur between learning style and type of instruction (Web-dependent or traditional) on students achievement and attitudes.

Recommendations and Implications

The researchers recommend that the future sections of AEE 3203 - Technical Writing in Agricommunication at Mississippi State University be taught using the WWW with laboratory technique. This recommendation was implemented Fall semester, 1996.

More research is needed to further explain the effectiveness of the WWW as an instructional technique. The WWW is a fast-growing medium, but this is one of the first experimental studies that have focused on using the WWW for college-level instruction in agricultural education. The results of this study cannot be generalized to other populations or subject matter. The results of this study, however, indicate that the WWW is potentially an effective medium for instruction.

Changes in instructional materials and methods should be evaluated in terms of achievement, study time, and attitude toward material. This study focused only on achievement and attitudes. Further research should also include the amount of time students spend studying outside of class when the different teaching methods are used (Chinien & Boutin, 1994).

Teaching with the WWW was effective for this technical writing course. Studies need to be conducted in other disciplines with other student populations. Further studies should be conducted to determine the effectiveness of the WWW as a teaching tool.

Finally, studies should compare WWW instruction, lecture, and a combination of the two with learning styles. Goldberg (1996) found that students who had access to a lecture and WWW performed better than the two other groups who were given either lectures or WWW.

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The Effects Of World Wide Web Instruction And Traditional Instruction And Learning Styles On Achievement And Changes In Student Attitudes In A Technical Writing In Agricommunication Course

A Critique

Ed Osborne
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This is a very sound study that is worth the time required to digest its rather complex procedures, data analysis, and outcomes. In addition, these researchers have tackled a new area of inquiry in a bold way. The results of this study contribute not only to our knowledge base in agricultural education, but also to the broader field of technology-assisted learning. And this is a very well written paper - as we should expect from a team of technical writing instructors.

The authors clearly define all key terms and variables (e.g., multimedia, hypermedia, etc.), even though it would be easy to assume that the reader already has this operating basis. The problem statement and presentation of research hypotheses is straightforward and clear, and the researchers do a nice job of tracking these hypotheses throughout the paper. Research findings from the literature are presented as they pertain to computer-aided learning, student attitudes toward method and content area, and learning styles. However, this review was lacking in some areas, particularly in the area of learning styles, where only a few studies were cited, all of which related to agricultural education. The procedures for the study were complex but well described. This is a quasi-experimental study, since random selection of subjects from the population was not possible. Several questions emerge as one reads the procedures section: Was the content of the overhead transparencies and the computer-generated slides the same? Did the web-based group also have access to a printed version of the handouts? Did the researchers in any way track student use of the web materials for the web-based group?

The researchers are to be commended for appropriately using MANOVA for data analysis in this study. Results of the MANOVA analyses were clearly presented in the paper, with concise and accurate supporting narrative. Similarly, all conclusions and recommendations listed in the paper were appropriate and well grounded in the findings. I would question the practical significance of the higher midterm exam mean score for the web-based group. This same concern applies to the observed gains in attitude. A few other questions remain. Why were scores on the midterm exam so low, averaging 55-60% for the two groups? Was it the web, the lab section, or both that contributed to the differences found in achievement and attitudes? Another study should be conducted that separates the effects of these two elements. Again, this was an excellent study and a good model to follow when preparing a paper for presentation.

Concurrent Session E

Theme:
Postsecondary Agricultural Issues

Assessment of College Achievement of Incoming Students to the College of Agriculture at a Land-Grant Institution
Allison J.L. Touchstone, Kuna HS, Kuna ID
Lou E. Riesenberg, University of Idaho

Chairperson:
James E. Christiansen
Texas A&M University

Attitudes of Iowa State University College of Agriculture Freshmen Toward Agriculture
Randall J. Andreason, Iowa State Univ.
Lisa M. Breja, Iowa State University
James E. Dyer, Iowa State University

Discussant:
William G. Camp
Virginia Tech

Demographic Characteristics of Preservice Teacher Education Students and Their Reasons for Majoring in Agricultural Education
Kirk A. Swortzel, Auburn University

Facilitator:
Carol A. Conroy
Cornell University

Differences in Reasons Why Individuals Choose to Become Teacher Educators by Demographic Characteristics
Kirk A. Swortzel, Auburn University

Assessment Of College Achievement Of Incoming Students To The College Of Agriculture At The University Of Idaho

Allison J. L. Touchstone
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Lou E. Riesenberg
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INTRODUCTION

In recent history, Colleges of Agriculture nationwide have experienced declining enrollments in their fields of study. Litzenberg, Suter, and Whatley (1991) found that Colleges of Agriculture have witnessed a steady decline in enrollments since 1977, when there were 98,000 students enrolled compared to the 60,512 students enrolled in the 1991 survey of NASULGC (National Association of State Universities and Land Grant Colleges) schools.

Traditionally, Colleges of Agriculture have targeted three major groups of students as a part of their recruitment process: students from secondary agriculture programs, students from a farming background, and students who had been involved in agricultural youth organizations such as 4-H and FFA. Are these still viable groups to target for recruitment? Are these students successful in the college setting? Should our college recruitment base target additional populations of students?

It is imperative for colleges of agriculture to graduate qualified agricultural experts. In order to do this, it is important to recruit students who will be successful in their field of study. By identifying qualifying characteristics of successful graduates from the University of Idaho College of Agriculture, similar students can be targeted for recruitment by colleges of agriculture. Additionally, by identifying types of students who consistently display difficulty in the college setting, university faculty and staff can make appropriate academic assistance known and available to students early in their college career.

REVIEW OF LITERATURE

Cole and Boker (1989) identified a need to describe the potential for success possessed by enrollees in the College of Agriculture at Oregon State University. One of the purposes of their study was to identify what difference in collegiate success, if any, was observed between students who had enrolled in high school agriculture programs and those who had enrolled in college preparatory programs. Cole and Boker (1989) found that high school agriculture students were often more sure of their major, changing majors less often, and graduating in fewer semesters than non-enrollees.

Raven and Barrick (1991) found that Colleges of Agriculture are not depending solely upon new student enrollees from agricultural backgrounds. Instead, a balance is being observed among student backgrounds of urban, suburban, semi-rural, and rural backgrounds. Recruitment for Colleges of Agriculture is becoming increasingly important in rural, semi-rural, suburban, and urban communities nationwide. Rush (1990) found that 69.9% of the students entering the University of Idaho College of Agriculture were from rural acreages. Taylor (1990) found that new students in the College of Agriculture at

Mississippi State University who were from urban areas increased from 37.6% in 1977 to 54.5% in 1987. Raven and Barrick (1991) found that of students who enrolled in the College of Agriculture at The Ohio State University in 1982, 21% of the students who graduated with degrees from the College of Agriculture were from urban backgrounds while 21.8% of the graduates were from rural backgrounds. Dyer, Lacey, and Osborne (1995) concluded that students enrolling in the College of Agriculture at the University of Illinois from agricultural backgrounds were a minority of the total student population.

Colleges of Agriculture have traditionally relied upon secondary agriculture program completers as a significant portion of their recruitment targets and successful students. Riesenberg and Lancaster (1990) found no significant differences between secondary agriculture program completers and non-completers in high school grade point average or rank. This finding suggests that the students comprise similar populations.

Warmbrod and Doerfert (1987) compared the academic achievement rates in the college setting of students who had been enrolled in high school vocational agriculture classes and those who had not. They found that the percentage of former agriculture students who graduated or were still enrolled in good academic standing at the time of the study was higher than the students who had not enrolled in high school agriculture courses.

OBJECTIVES

This study was conducted to describe students in the University of Idaho College of Agriculture at the University of Idaho and to assess the college achievement of students who were involved in agriculture or secondary agricultural education programs. The specific objectives of this study were to:

1. Describe the students who were new to the University of Idaho College of Agriculture for the fall semester of 1985 through 1995 using pre-college demographic and achievement data.
2. Describe the academic achievement in college attained by students who were involved in agricultural youth programs prior to college, namely 4-H and FFA.
3. Describe the academic achievement in college attained by students who were involved in secondary agricultural education programs.
4. Describe the academic achievement in college attained by student from farm versus non-farm backgrounds.

METHODS

The population of this study included 1111 new freshmen and new transfer students that enrolled in the College of Agriculture at the University of Idaho for the fall semesters of 1985 through 1995. A complete data set was developed for 836 individuals of the potential population.

The data used in this study were collected from two different sources. The pre-college demographic data and achievement data were compiled from an incoming student survey as a part of a longitudinal study in the Department of Agricultural and Extension Education at the land-grant institution. This survey questionnaire has been utilized at the beginning of each fall semester to collect pre-college demographic and achievement data from students entering the College of Agriculture at the University of Idaho for the first time during that particular semester. The second source of data was supplied by the Management Information Services at the University of Idaho. Respondents' identification numbers were supplied to that office and data was obtained from the students' permanent university records.

Demographic data was attained from both sources of information. In the Incoming Student Survey utilized for this study, students were asked to select from a list of variables and responses and indicate which answer was most applicable to their background and/or situation. The information from the survey was then used to compare the college achievement of the students based on the following achievement variables:

1. semester one grade point average (GPA)
2. semester one net credits earned
3. semester three cumulative GPA
4. semester three cumulative credits
5. semester five cumulative GPA
6. semester five cumulative credits
7. semester seven cumulative GPA
8. semester seven cumulative credits
9. semester one academic standing
10. semester three academic standing
11. semester five academic standing
12. semester seven academic standing
13. semesters attended the university (regardless of graduation status)
14. semesters to university graduation

The information presented in this paper is a portion of the data presented in the overall study. The complete study considered four major objectives with ten specific research questions which identified specific aspects of the objectives and presented much broader findings and conclusions.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS/PC+). The .05 level of significance was set a priori for interpreting the findings of this study. Independent t-tests and frequency comparisons were utilized to compare the responses and achievements of the respondents.

FINDINGS AND RESULTS

Objective 1.

Describe the students who were new to the University of Idaho College of Agriculture for the fall semester of 1985 through 1995 using pre-college demographic and achievement data.

Nearly fifty percent (48.9%) of the new students in the College of Agriculture at the University of Idaho were from a farm or ranch background, 14.5% of the group were from a rural, non-farm background, while only 18.4% were from towns with populations greater than 10,000 people (Table 1).

Vocational agriculture was offered at 61.8% of the high schools attended by individuals in this study. Slightly over 51% of the respondents had completed one or more semesters of vocational agriculture classes in their high school, and over 46% of the respondents had been FFA members (Table 2). The average length of FFA membership for students involved in the organization was 1.75 years (Table 2).

Table 1.
Percent of Incoming Students to the College of Agriculture at the University of Idaho 1985-1995 by Type of Family Residence.

Type of Family Residence	Frequency (n)	Percent
Farm or ranch	409	48.9
Rural, non-farm	121	14.5
Town of less than 500	13	1.6
Town of 500-1000	26	3.1
Town of 1000-2000	27	3.2
Town of 2000-5000	31	3.7
Town of 5000-10,000	33	3.9
Town of more than 10,000	154	18.4

Objective 2.
Describe the academic achievement in college attained by students who were involved in agricultural youth programs prior to college, namely 4-H and FFA.

Significant differences were found between the two groups, those students who had been involved in 4-H or FFA and those who had not, in the following test variables: semester one grade point average and semester three cumulative grade point average. Semester one grade point average was significantly different between students involved in 4-H or FFA (2.651) and those who were not (2.838), as was the semester three GPA of the two groups with 4-H and/or FFA members earning a mean GPA of 2.675 and those who were not involved earning a mean GPA of 2.806. No significant differences between groups were identified in the remaining test variables (Table 3).

Table 2.
Percentage of Incoming Students to the College of Agriculture at the University of Idaho 1985-1995 by Participation in Secondary Agriculture, FFA, and 4-H.

Profile descriptor	Frequency (n)	Percent
Semesters of Secondary Agriculture Completed		
No semesters completed	404	48.3
1-2 semesters completed	61	7.3
3-4 semesters completed	69	8.3
5-6 semesters completed	60	7.2
7-8 semesters completed	231	27.6
Years of FFA Membership		
0 years	440	52.6
1 years	39	4.7
2 years	34	4.1
3 years	52	6.2
4 years	178	21.3
5 years	61	7.3
6 years	16	1.9
7 years	8	1.0
8 years	1	.1
10 years	1	.1
Years of 4-H Membership		
0 years	365	43.7
1 to 4 years	163	19.5
5 to 8 years	144	17.3
9 to 16 years	159	19.0

The second section of Table 3 and similar tables compares variables (probation and disqualification status in various semesters) that have more than two possible answers (potential responses: Good Standing, Probation, Dean's Referral, Disqualification). Therefore, the Chi Square comparison is more appropriate than the previously used Independent T-test.

Table 3.
Academic Achievement in the College of Agriculture at the University of Idaho by Student Involvement in 4-H or FFA Programs for Incoming Students 1985-1995.

Variable	Mean	T-score	Probability
Semester 1 net credits		.564	.573
4-H/FFA involvement (n=581)	13.639		
Not in 4-H/FFA (n=245)	13.469		
Semester 1 GPA		-2.724	.007*
4-H/FFA involvement (n=581)	2.651		
Not in 4-H/FFA (n=245)	2.838		
Semester 3 cumulative credits		-1.684	.093
4-H/FFA involvement (n=422)	55.578		
Not in 4-H/FFA (n=170)	60.282		
Semester 3 cumulative GPA		-2.030	.043*
4-H/FFA involvement (n=422)	2.675		
Not in 4-H/FFA (n=170)	2.806		
Semester 5 cumulative credits		-1.148	.252
4-H/FFA involvement (n=304)	81.013		
Not in 4-H/FFA (n=124)	84.387		
Semester 5 cumulative GPA		-.960	.338
4-H/FFA involvement (n=304)	2.759		
Not in 4-H/FFA (n=124)	2.824		
Semester 7 cumulative credits		-1.089	.277
4-H/FFA involvement (n=209)	27.747		
Not in 4-H/FFA (n=76)	35.078		
Semester 7 cumulative GPA		-1.320	.188
4-H/FFA involvement (n=209)	2.779		
Not in 4-H/FFA (n=76)	2.881		
Semesters to graduation		.498	.619
4-H/FFA involvement (n=178)	8.135		
Not in 4-H/FFA (n=67)	7.955		
Semesters attended		1.026	.305
4-H/FFA involvement (n=581)	5.270		
Not in 4-H/FFA (n=245)	5.008		

Variable	Expected	Actual	Chi-Square	Probability
Semester 1 probation/disqual			.031	.861
4-H/FFA involvement	66.3	67		
Not in 4-H/FFA	27.7	27		
Semester 3 probation/disqual			.226	.635
4-H/FFA involvement	51.3	53		
Not in 4-H/FFA	20.7	19		
Semester 5 probation/disqual			.008	.929
4-H/FFA involvement	31.3	31		
Not in 4-H/FFA	12.7	13		
Semester 7 probation/disqual			1.594	.207
4-H/FFA involvement	18.3	21		
Not in 4-H/FFA	6.7	4		

* $p<.05$

Objective 3.
Describe the academic achievement in college attained by students who were involved in secondary agricultural education programs.

Significant differences were identified among the groups in semester one net credits, semester one grade point average, semester three cumulative credits, semester three cumulative grade point average, semester five cumulative grade point average, semesters to graduation, and total number of semesters the students attended the land-grant institution.

Students who had not enrolled in secondary agricultural education programs consistently earned more cumulative credits, had higher grade point averages, and graduated sooner than students who had. Non-agriculture students graduated from the university in 7.70 semesters while it took an average 8.39 semesters for student with agricultural education experience to complete a university degree (Table 4).

Table 4.
Academic Achievement Attained in College by Student Enrollment in Secondary Agricultural Education Programs for Incoming Students in the College of Agriculture at the University of Idaho, 1985-1995.

Variable	Mean	T-score	Probability
Semester 1 net credits		5.067	.002*
Not enrolled in ag ed (n=401)	14.032		
Enrolled in ag ed (n=417)	13.194		
Semester 1 GPA		4.250	.000*
Not enrolled in ag ed (n=401)	2.841		
Enrolled in ag ed (n=417)	2.576		
Semester 3 cumulative credits		2.391	.017*
Not enrolled in ag ed (n=282)	60.114		
Enrolled in ag ed (n=304)	54.053		
Semester 3 cumulative GPA		4.189	.000*
Not enrolled in ag ed (n=282)	2.837		
Enrolled in ag ed (n=304)	2.594		
Semester 5 cumulative credits		.827	.409
Not enrolled in ag ed (n=202)	83.188		
Enrolled in ag ed (n=224)	80.969		
Semester 5 cumulative GPA		2.286	.023*
Not enrolled in ag ed (n=202)	2.847		
Enrolled in ag ed (n=224)	2.707		
Semester 7 cumulative credits		.409	.683
Not enrolled in ag ed (n=120)	102.900		
Enrolled in ag ed (n=163)	101.755		
Semester 7 cumulative GPA		1.813	.071
Not enrolled in ag ed (n=120)	2.871		
Enrolled in ag ed (n=163)	2.746		
Semesters to graduation		-2.140	.033*
Not enrolled in ag ed (n=110)	7.700		
Enrolled in ag ed (n=133)	8.391		
Semesters attended		-2.001	.046*
Not enrolled in ag ed (n=401)	4.963		
Enrolled in ag ed (n=417)	5.432		

* $p<.05$

Table 4 (Cont'd)
Academic Achievement Attained in College by Student Enrollment in Secondary Agricultural Education Programs for Incoming Students in the College of Agriculture at the University of Idaho, 1985-1995.

Variable	Expected	Actual	Chi-Square	Probability
Semester 1 probation/disqual			.798	.372
Not enrolled in ag ed	45.0	41		
Enrolled in ag ed	47.0	51		
Semester 3 probation/disqual			1.334	.248
Not enrolled in ag ed	34.6	30		
Enrolled in ag ed	37.4	42		
Semester 5 probation/disqual			.834	.361
Not enrolled in ag ed	20.9	18		
Enrolled in ag ed	23.1	26		
Semester 7 probation/disqual			1.215	.270
Not enrolled in ag ed	10.6	8		
Enrolled in ag ed	14.4	17		

Objective 4.
Describe the academic achievement in college attained by students from farm versus non-farm backgrounds.

Significant differences were found between the two groups in one of the test variables, semester one net credits. Students from a farm background incurred an average of 13.3 credits in semester one while non-farm students earned 13.9 credits in the same semesters. No significant differences between groups were identified in the remaining test variables (Table 5).

Table 5.
Academic Achievement Attained in College by Student Background, Farm vs. Non-farm, for Incoming Students in the University of Idaho College of Agriculture 1985-1995.

Variable	Mean	T-score	Probability
Semester 1 net credits		-2.249	.025*
Farm (n=405)	13.306		
Non-farm (n=402)	13.925		
Semester 1 GPA		-1.659	.097
Farm (n=405)	2.662		
Non-farm (n=402)	2.767		
Semester 3 cumulative credits		-1.307	.192
Farm (n=289)	54.927		
Non-farm (n=290)	58.259		
Semester 3 cumulative GPA		-1.879	.061
Farm (n=289)	2.657		
Non-farm (n=290)	2.768		
Semester 5 cumulative credits		.208	.835
Farm (n=203)	81.975		
Non-farm (n=213)	81.413		
Semester 5 cumulative GPA		-.407	.685
Farm (n=203)	2.768		
Non-farm (n=213)	2.794		
Semester 7 cumulative credits		-.140	.889
Farm (n=138)	101.964		
Non-farm (n=137)	101.358		

Table 5 (Cont'd)

Academic Achievement Attained in College by Student Background, Farm vs. Non-farm, for Incoming Students in the University of Idaho College of Agriculture 1985-1995.

Semester 7 cumulative GPA			-.543	.587
Farm (n=138)	2.792			
Non-farm (n=137)	2.830			
Semesters to graduation			.786	.433
Farm (n=120)	8.225			
Non-farm (n=114)	7.965			
Semesters attended			.163	.871
Farm (n=405)	5.190			
Non-farm (n=402)	5.152			

Variable	Expected	Actual	Chi-Square	Probability
Semester 1 probation/disqual			1.349	.245
Farm	45.8	51		
Non-farm	45.2	40		
Semester 3 probation/disqual			.286	.593
Farm	35.9	38		
Non-farm	36.1	34		
Semester 5 probation/disqual			.107	.744
Farm	20.0	21		
Non-farm	21.0	20		
Semester 7 probation/disqual			.404	.525
Farm	11.5	13		
Non-farm	11.5	10		

* $p<.05$

CONCLUSIONS

As enrollments have declined within colleges of agriculture, attempts have been made to identify successful students within these colleges in order to target student recruitment. Understanding the students who have attended the University of Idaho College of Agriculture in the past may assist in targeted recruitment in the future.

The analysis and interpretation of the findings of this study supported the following conclusions:

1. About half of the new enrollees in the University of Idaho College of Agriculture had been involved in a secondary agriculture program.

2. Nearly thirty percent of new enrollees had been involved in secondary agriculture for four years.

3. Students who had not enroll in secondary agriculture programs performed better in the selected achievement variables than did students who had enrolled in secondary agriculture programs.

4. About 20% of new enrollees were members of the FFA organization for four or more years.

5. Students who were not involved in 4-H and/or FFA programs performed significantly better in selected achievement variables than did students who were involved in these agricultural youth programs.

6. Family residence did not significantly relate to academic achievement of incoming students in the University of Idaho College of Agriculture.

Although significant differences were observed in many of the comparisons made, were the students, who were performing in a significantly lower fashion, performing at an unacceptable rate? In most cases the answer is no. Objective 2 compared student achievement between those who had been involved in secondary agriculture programs and those students who had not. A marked difference in achievement was identified between the two groups. Additional research is in order to determine if differences consistently exist between the two populations, or if this finding is limited to the students at this specific land-grant institution. Also, the significant differences observed do not necessarily mean that the students are struggling in the college atmosphere. Secondary agricultural education students earned a first semester GPA of 2.576, which is significantly lower than the 2.841 of non-agriculture students. However, this is an acceptable GPA in the eyes of the university. Although differences exist, the question must also be addressed as to whether or not the differences are severe enough to warrant action on the part of the university. These performance standards are not showing that students are unsuccessful, just that there is a difference in performance between two groups of students.

RECOMMENDATIONS

Based on the research findings and conclusions of this study, the following recommendations were formed:

1. Students who have been enrolled in secondary agriculture programs should continue to be recruited to attend the University of Idaho College of Agriculture. These students have been a traditional recruitment base for the College of Agriculture, and have consistently attended the university. The findings of this study suggest that, as a vital population in our College of Agriculture, these students may need additional support after enrollment.
2. Research is needed to ascertain why secondary agriculture program completers tend to be less successful in the College of Agriculture at the University of Idaho.
3. Students who have been involved in agricultural youth programs such as 4-H and FFA should continue to be recruited by the College of Agriculture at the University of Idaho. These students are also a traditional recruitment base for many colleges of agriculture, and have continually attended Colleges of Agriculture in land-grant institutions.
4. Research is needed to determine why agricultural youth program participators achieve lower in the University of Idaho College of Agriculture than program participators.
5. Further recruitment efforts should be made targeting students from non-farm residences.
6. Further recruitment efforts should be made targeting students who have not been involved in secondary agriculture programs.
7. Further recruitment efforts should be made targeting students who have not been 4-H and FFA members.

Attempts have been made nationwide to recruit additional students into Colleges of Agriculture from both new and traditionally recruited populations. These recruitment efforts have maintained enrollments, but few universities have demonstrated a marked increase in agricultural enrollments.

More research is needed to identify effective recruitment techniques for potentially successful students. As one aspect of that necessity, research must continue to be done which identifies the observable characteristics of potentially successful students. Research should be conducted nationwide in an attempt to identify consistent indicators of college success in high school graduates, non-traditional students, and transfer students in College of Agriculture settings.

Land-grant institutions are the cornerstone of the agricultural education system in higher education. As members of that educational system, it is imperative that Colleges of Agriculture recruit students who are dedicated to the agricultural industry, students who have the potential to be successful as students and professionals, and students who will represent agriculture as well as land-grant institutions in a positive way.

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Assessment Of College Achievement Of Incoming Students To The College Of Agriuclture At A Land-Grant Institution

A Critique

William G. Camp
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Overview

The authors of this paper analyzed data from all entering College of Agriculture freshmen at a land-grant university over an 11-year period. They reported demographic and background characteristics and compared achievement of students with various lengths of 4-H or FFA membership and various lengths of enrollment in agricultural education. They found significant differences favoring those students without agricultural education, 4-H, or FFA backgrounds.

Strengths

With the growing proportion of non-rural students in colleges of agriculture, the study asks some very pertinent questions. In previous decades, the vast majority of agriculture students were from farms and rural areas and most had vocational agriculture, 4-H, and FFA backgrounds. Because that is no longer the case, we need the kinds of information the researchers have provided.

Concerns

The researchers analyzed population data using inferential techniques. This is not a major departure from normal practice in educational research, but at least an acknowledgment and justification is warranted when we treat a population as though it were a sample of some larger population. Multiple t-tests substantially diminished the indicated alpha level.

Questions

Can we realistically combine students with one to ten years of FFA membership and one to 16 years of 4-H membership into a single group to compare to the group of students with no such experience?

Would the use of covariates such as high school grade point average or College Board scores explain the differences found?

Commendations

The researchers used an extant data base to investigate a set of real-world questions. Too many researchers ignore the existence of high quality data sets in the mistaken assumption that original research requires original data.

The researchers conducted a thoughtful interpretation of their findings and provided important, meaningful recommendations for action and for further research.

Attitudes Of Iowa State University College Of Agriculture Freshmen Toward Agriculture

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Introduction and Theoretical Framework

Enrollment in agriculture programs at both the university and high school levels has undergone major changes over the past twenty years. From the peak numbers of the late 1970s, enrollments at the high school level plummeted with the onset of the farm crisis in the late 1970s and early 1980s (Dyer & Osborne, 1994). In the two states whose economies are most closely tied to the agricultural sector, Illinois and Iowa, some of the most drastic changes were reported. In Illinois, agriculture program enrollments decreased by over 60% from a total of 29,502 students enrolled in 397 programs to 11,733 students in 325 programs (Illinois State Board of Education, 1993). In Iowa, an enrollment of 17,293 students in 245 programs dwindled to only 9,161 students in 255 programs from 1976 to 1990, a decrease of nearly 53% (Iowa Department of Education, 1997) . Over the same time period, enrollment in Illinois and Iowa public schools decreased by 25% and 20%, respectively, indicating that other factors were contributing to the attrition in agriculture program enrollments (United States Department of Education [USDE], 1996).

This enrollment crisis created a ripple effect that struck at the university level in the late 1980s. Manderscheid (1988) reported a 24% decline in Land Grant University agriculture enrollments and a 13% decrease in non-Land Grant University agriculture enrollments from 1978 to 1988. Paralleling this decrease in university agriculture program enrollments were cutbacks in faculty positions. According to the American Association for Agricultural Education, university agricultural education faculty membership decreased from a 1984 high of 326 members to a 1995 low of 254 members, a decrease of 22% (American Association for Agricultural Education, 1996).

As universities were responding to decreased numbers by downsizing agricultural education departments and programs, high school enrollments in agriculture courses were rebounding. Several states modernized agriculture curricula as suggested by the National Research Council (1988) and reaped almost immediate results in the form of increased student numbers. At an enrollment of nearly 12 million students in 1993-94, high school enrollments are within 10% of the pre-recession enrollments of 13.6 million students, even with a national decrease of just over 20% in the number of school age children (USDE, 1996).

At the university level, colleges of agriculture are also reporting increased enrollments. Litzenberg, Whatley, and Scamardo (1992) reported that with the exception of the North Central Region, agricultural enrollments had recovered to early 1980 levels. According to USDE numbers, 1992 enrollments in colleges of agriculture nationwide have increased by 18.9% over the 1981 enrollment of 802,000 students (USDE, 1996). However, the demographic composition of today's agriculture classes has changed from that of the 1980s. Scofield (1995) reported that 43% of students enrolling in the College of Agriculture at Iowa State University in the fall of 1994 were from urban backgrounds. According to Russell (1993), this lack of agricultural background and/or experience jeopardizes the long term future of the agricultural industry. Russell warned of an impending "brain drain" in the agricultural industry, jeopardizing its long term future if the loss to the agricultural industry of individuals trained and experienced in agriculture continues.

With an increasing number of freshmen coming from urban backgrounds and/or situations in which they have gained no knowledge of or experience in agriculture, new problems and opportunities have emerged. Colleges of Agriculture must provide information, not only in agriculture, but also about agriculture. However, losses of enrollments translate into losses of dollars from instructional budgets. The needed resources to provide this instruction may not be available.

The problem addressed by this research was how to identify and retain students who are likely to complete a program of instruction and seek employment in the industry of agriculture. The conceptual model for this study emphasized the need to study those factors that influence a student's selection and pursuit of a field of study and corresponding career choice. Fishbein and Ajzen (1975) provided the theoretical framework for this study. They determined that intentions to participate in an activity could be predicted based upon knowledge, observation, or other information about some issue. This suggested that a person's intent to pursue study in a field of agriculture, or to become actively involved in an agricultural career, may be predicted by analyzing his/her beliefs about agriculture. Greenwald (1989) supported this theory, reporting that individuals with positive attitudes toward a subject or situation tend to evaluate them positively.

Purpose

The primary purpose of this study was to assess the attitudes and intentions of Iowa State University College of Agriculture freshmen toward high school and university agriculture programs and the field of agriculture. A secondary purpose was to investigate student attitudes about the role of agricultural educators. The study addressed the following questions:

1. What were the attitudes of College of Agriculture freshmen toward the field of agriculture and educational programs in agriculture?

2. What were the attitudes of College of Agriculture freshmen toward their major areas of study?

3. What was the influence of high school agriculture program experiences on the attitudes of students who are now pursuing agricultural majors?

Procedures

This study used a descriptive survey which was administered to all freshmen in the 1996-97 class of the College of Agriculture at Iowa State University ($\underline{N}$ = 513). A student roster from the College's admissions office served as the population frame for this census study.

Survey instruments were mailed during the 1997 spring semester with a follow-up postcard reminder mailed after two weeks. A second instrument packet and reminder postcard were mailed at two-week intervals, respectively. A total of 401 (78%) surveys were returned. A random sample of ten percent of the non-respondents were contacted and completed the questionnaire via telephone. Summated means of these non-respondents were compared to early and late respondents with no significant differences noted, allowing generalization from the sample to the population.

The two-part questionnaire used in this study was developed and used by Dyer, Lacy and Osborne (1996) and was reviewed for content and face validity by College of Agriculture staff at that time. Part I of the questionnaire addressed demographic information and contained close-ended and partially close-ended questions. Part II of the instrument was divided into three constructs: Attitudes Toward Agriculture as an Area of Study, Attitudes Toward High School Agriculture Programs, and Attitudes Toward University Agriculture Programs. These sections used a five-point Likert-type scale (1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree). Dyer, et al. reported reliability estimates for the three constructs using Cronbach's Alpha ($\underline{r}$ = .85, .78, .88, respectively). Data were analyzed using descriptive statistics, including measures of central tendency and variability.

Results

A majority of students respondents was male (57%, n = 222) and Caucasian (97.2%, n = 369). African-American, Hispanic, and Asian ethnicity/ancestry were reported by five, four, and two students respectively (1.3%, 1.0%, and .5%) with an additional seven students (1.8%) reporting an ethnicity of "other."

Fifty-four percent (n = 214) of the respondents reported having completed at least one high school agriculture course, 47% (n = 182) indicated that they were FFA members, and 55.2% had been involved in 4-H. Nearly two-thirds (62.1%) of those students who had completed high school agriculture classes rated the programs as "good" while only 7.5% rated the quality "poor."

Nearly half of the respondents (n = 188, 47.5%) had farm backgrounds. An additional 28.8% of the students were from rural areas (but not farms) or small towns (<10,000), with the remaining 23.7% of the students indicating their geographical backgrounds were large or medium urban areas.

The majority of the respondents (66.4%, n = 263) indicated they had both paid and unpaid experiences in agriculture. Forty-six respondents (11.6%) indicated unpaid work experience only, 22 students (5.6%) reported paid work experience only, while 65 students (16.4%) indicated they had no agricultural experience prior to enrolling in the College.

Sources of information cited as most helpful in informing students about the College of Agriculture and/or Iowa State University included brochures (32.2%), campus visits (24.0%), letters from staff (20.7%), phone calls (9.4%), and personal contacts from faculty (6.7%).

Research Question 1: *What were the attitudes of College of Agriculture freshmen toward the field of agriculture and educational programs in agriculture?*

The attitudes of College of Agriculture freshmen toward the field of agriculture were generally positive. As indicated in Table 1, students viewed the field of agriculture as both scientific and technical. They disagreed with the statement that only students with farm backgrounds should pursue agricultural careers (M = 1.55). While less than half (45.9%) agreed that most people have a positive image of agriculture, 70.7% agreed that the image was improving.

Table 1
Attitudes Toward Agriculture as an Area of Study

Statement	Agree* f (%)	Uncertain f (%)	Disagree* f (%)
Agriculture is a scientific area of study.	371 (93.7)	19 (4.8)	6 (1.6)
Most people have a positive image of agriculture.	182 (45.9)	108 (27.3)	106 (26.7)
Agriculture is a highly technical field of study.	343 (96.7)	44 (11.1)	9 (2.3)
The image of agriculture is improving	280 (70.7)	88 (22.2)	28 (7.1)
Only students with farm backgrounds should pursue careers in agriculture.	13 (3.3)	22 (5.6)	361 (91.1)

*The term "agree" includes the combined responses of "strongly agree" and "agree". The term "disagree" includes the combined responses of "strongly disagree" and "disagree."

Respondents were very supportive of high school agriculture programs (Table 2). Over three-fourths (75.7%) of freshmen in the College of Agriculture agreed that more students should be encouraged to take high school agriculture classes. Accordingly, over two-thirds agreed (68.5%) that high school agriculture courses were applicable to college preparatory programs and that these courses were good preparation (58.7%) for studying agriculture in college. The students disagreed with the statements that that high school agriculture courses are better suited for male students and that only students pursuing careers in agriculture should enroll in high school agriculture.

Table 2
Attitudes Toward High School Agriculture Programs

Statement	Agree* f (%)	Uncertain f (%)	Disagree* f (%)
More students should be encouraged to enroll in high school agriculture programs.	299 (75.7)	76 (19.3)	20 (5.1)
College-bound students should be encouraged to enroll in high school agriculture programs.	271 (68.5)	95 (24.0)	30 (7.6)
High school agriculture is good preparation for college study in agriculture.	231 (58.7)	137 (34.8)	26 (6.6)
High school agriculture should become less vocational.	80 (20.3)	207 (52.5)	107 (27.2)
High school agriculture should become more scientific.	172 (43.6)	176 (44.7)	46 (11.7)
High school agriculture classes are better suited to male students.	65 (16.5)	104 (26.3)	225 (57.1)
High school study in agriculture is easier than in other subjects.	131 (33.4)	177 (45.0)	85 (21.6)
High school agriculture courses are beneficial for higher-achieving students.	151 (38.5)	197 (50.3)	44 (11.2)
High school agriculture courses are beneficial for lower-achieving students.	138 (35.0)	201 (51.0)	55 (13.9)
Most high school students should take some course work in agriculture.	240 (60.6)	102 (25.8)	54 (13.7)
Only students pursuing careers in agriculture should enroll in high school agriculture courses.	39 (9.9)	59 (14.9)	298 (75.3)

*The term "agree" includes the combined responses of "strongly agree" and "agree". The term "disagree" includes the combined responses of "strongly disagree" and "disagree."

Students generally believed that everyone would benefit from college course work in agriculture (see Table 3). Approximately two-thirds (66.1%) of the respondents agreed with the statement that more students should be encouraged to enroll in college agriculture courses. Likewise, 66.7% of the freshmen disagreed with the statement that only students pursuing careers in agriculture should enroll in college agriculture courses. More than three-fourths (76.1%) of the students surveyed disagreed that college agriculture courses are better suited to male students.

Research Question 2: *What were the attitudes of freshmen College of Agriculture students toward their major area of study?*

Nearly all students indicated they were happy in the College of Agriculture. Only 5.9% of the respondents indicated they were planning a change of colleges (see Table 4) and only 6.5% intended to enroll in another university. Likewise, most respondents (n = 294, 82.7%) reported no intent to change majors. Thirty-one students (8.8%) indicated a definite plan to change of majors, whereas 30 students (8.5%) indicated a possible change.

Table 3
Attitudes Toward University Agriculture Programs

Statement	Agree* f (%)	Uncertain f (%)	Disagree* f (%)
More students should be encouraged to enroll in university agriculture programs.	261 (66.1)	112 (28.4)	22 (5.6)
College agriculture classes are better suited to male students.	19 (4.9)	75 (19.0)	300 (76.1)
College study in agriculture is easier than in most other subjects.	42 (11.9)	93 (23.8)	224 (64.3)
Most college students should take some course work in agriculture.	191 (48.3)	128 (32.3)	77 (19.5)
Only students pursuing careers in agriculture should enroll in college agriculture courses.	66 (16.6)	66 (16.7)	264 (66.7)

*The term "agree" includes the combined responses of "strongly agree" and "agree". The term "disagree" includes the combined responses of "strongly disagree" and "disagree."

Table 4
College of Agriculture Freshmen Planning to Change Colleges and/or Majors

		Students contemplating change of college		Students contemplating change of majors	
Major	N	n	%	n	%
Agricultural Systems Technology	16	0	0.0	2	12.5
Agronomy	16	0	0.0	3	18.7
Animal Science, Pre-Vet, Dairy Science	135	5	3.7	20	14.8
Horticulture, Turfgrass Management	25	0	0.0	4	16.0
Agricultural Studies	32	0	0.0	3	9.4
Agricultural Business	51	5	9.8	6	11.8
Genetics, Zoology	11	2	18.8	4	36.4
Agricultural Education	15	0	0.0	1	6.7
Agriculture-Undeclared	14	4	28.6	7	50.0
Forestry	12	1	8.3	4	33.3
Animal Ecology	18	3	16.7	1	5.6
Microbiology	13	2	15.4	3	23.1
Food, Nutritional Science	4	0	0.0	1	25.0
Public Service Administration	3	0	0.0	1	33.3
Environmental Science	1	0	0.0	0	0.0
Biochemistry	2	0	0.0	1	50.0
Totals	350	22	5.9	61	17.3

Research Question 3: *What was the influence of high school agriculture program experiences on the attitudes of students who are now pursuing agricultural majors?*

A majority (n = 214, 54%) of the College freshmen reported course work in high school agriculture whereas 182 students (46%) reported no high school course work in agricultural education. Of those who did not complete agriculture course work, 68.7% did not have access to a high school program. The second most cited reason was a conflict with college preparatory courses.

Almost all students (n = 197, 97.0%) from high school agriculture programs indicated that they intended to graduate from the College of Agriculture and pursue a career in agriculture. Only six students indicated otherwise. By comparison, 90.5% (n = 152) of those students who did not enroll in high school agriculture programs indicated that they plan to graduate in the College of Agriculture. Sixteen students indicated intents to change colleges.

Of the 169 students who had been enrolled in high school agriculture programs and were also FFA members, 166 (98.2%) indicated intentions to graduate with a degree in the College of Agriculture. Likewise, of the 198 students who had been 4-H members, 192 (97.0%) also indicated intentions to graduate through the College of Agriculture.

Students who had completed high school agriculture courses expressed more positive attitudes toward educational programs in agriculture (see Table 5). In addition, these students disagreed (M = 1.62) with the statement that only students with farm backgrounds should pursue careers in agriculture. Students with no high school agriculture course work strongly disagreed with the statement (M = 1.43).

Students indicated that the most influential person in their decision to attend the College of Agriculture was their high school agriculture teacher (20.0%), followed by high school guidance counselor (16.4%), sibling (10.9%), parent (7.3%), and friend (5.5%). For those students who had decided to transfer out of the college/university, most common influences were relatives/friends (25%), teachers (10%), perceived lack of job opportunities (10%), academic pressure (10%), and not feeling part of the program (10%).

Conclusions, Recommendations, and Implications

Nearly all students indicated they were happy in the College of Agriculture. Less than 6% of the respondents indicated a likely change of colleges. These numbers contrasted sharply with those reported by Dyer, Lacey, and Osborne (1996). Dyer, et al. reported that nearly 40% of the freshmen class in the College of Agriculture at the University of Illinois at Urbana-Champaign intended to leave the College of Agriculture prior to graduation. In addition, the researchers reported that nearly 50% of the U of I freshmen intended to change majors within the College as compared to 17.3% at Iowa State. Why do students choose to remain in one college but leave another? Given the geographical and peer comparisons between the two institutions, further study should contribute to understanding students' rationale.

The College of Agriculture at Iowa State University continues to attract students with farm or rural backgrounds and who have completed high school agriculture courses. The researchers in this study found that the percentage of students coming from large or medium urban areas had declined from 43% in 1995 to 23.7% in 1996. This finding supports a recent article appearing in the Des Moines Register (Pins, 1997) which indicated that a "rural rebound" is occurring throughout the United States as three-fourths of the nation's 2,304 non-metro counties are growing. This is in contrast to growth rates in the 1980s when less than half of Iowa's counties experienced an increase in population. If the same phenomenon is occurring nationwide, this increase in population in rural areas should fuel enrollment and resources into colleges of agriculture and provide even greater demand for additional high school agriculture programs. Major efforts and support from universities should be expended in providing assistance in establishment of those programs.

Table 5

Comparison of Attitudes of High School Agriculture Program Versus Non-Program Graduates

Statement	No High School Agriculture		High School Agriculture	
	M	SD	M	SD
Agriculture is a scientific area of study.	4.37	.72	4.37	.61
Most people have a positive image of agriculture	3.19	1.00	3.28	.99
Agriculture is a highly technical field of study.	4.07	.72	4.19	.67
The image of agriculture is improving.	3.77	.82	3.87	.84
More students should be encouraged to enroll in university agriculture programs	3.63	.80	3.92	.81
More students should be encouraged to enroll in high school agriculture programs	3.73	.91	4.37	.77
College-bound students should be encouraged to enroll in high school agriculture courses.	3.68	.97	4.11	.89
High school agriculture is good preparation for college study in agriculture.	3.46	.85	4.13[a]	.97
High school agriculture should become less vocational.	3.05	.69	2.82	.96
High school agriculture should become more scientific.	3.39	.73	3.37	.91
Only students with farm backgrounds should pursue careers in agriculture.	1.43	.64	1.63[a]	.85
High school agriculture courses are better suited to male students.	2.46	1.08	2.20	1.14
College agriculture courses are better suited to male students.	1.96	.91	1.87	.81
High school study in agriculture is easier than in most other subjects.	3.00	.63	3.29	1.12
College study in agriculture is easier than in most other subjects.	2.29	.94	2.27	.96
High school agriculture courses are beneficial for higher-achieving students.	3.10	.60	3.51[a]	.91
High school agriculture courses are beneficial for lower-achieving students.	3.01	.68	3.44	.93
Most high school students should take some course work in agriculture.	3.35	.87	3.82[a]	.90
Most college students should take some course work in agriculture.	3.26	.93	3.43	.99
Only students pursuing careers in agriculture should enroll in high school agriculture.	2.34	.84	2.00	.89
Only students pursuing careers in agriculture should enroll in college agriculture.	2.45	.91	2.30	.91

[a] Means were categorically different. Categories of agreement were: "Strongly Disagree" (M = 1.00-1.49), "Disagree" (M = 1.50-2.49), "Uncertain" (M = 2.50-3.49), "Agree" (M = 3.50-4.49), and "Strongly Agree" (M ≥4.50).

High school agriculture programs are good investments by those interested in promoting agriculture. Likewise, graduates of these programs are good investments by colleges of agriculture. Students who have enrolled in high school agriculture, and those who were involved in FFA and/or 4-H, are more likely to complete a four-year degree in the College of Agriculture and choose agriculture as a career than are freshmen who have not had those experiences. The research indicated that 97% of students that enrolled in high school agriculture plan to graduate from the College of Agriculture and pursue a career in the industry. This percentage increased slightly if students were also involved in FFA and remained constant for those involved in 4-H. The College of Agriculture should target high school agriculture programs in its recruitment program. By directing recruitment efforts toward this group of students, the College of Agriculture can make more efficient use of resources and increase retention rates.

Many secondary students in Iowa do not have the opportunity to enroll in high school agriculture programs. This study found that of those students not enrolling in high school agriculture, 68% did not have access to such a program. The second most cited reason was a conflict with college preparatory courses. The number of high school agriculture programs in the state should increase so that all students have access to agricultural experience, and classes should be offered at times that will minimize scheduling conflicts. An increase in the number of, and enrollment in, high school agriculture programs, should provide the College of Agriculture even greater enrollment and retention opportunities.

High school agriculture teachers continue to play an important role in assisting students in determining whether or not to pursue a college degree. Twenty percent of the respondents indicated their agriculture teacher was the most influential source in making this decision. High school guidance counselors, siblings, and parents were respectively mentioned as the most influential person by 16.4%, 10.9%, and 7.3% of the respondents. The College of Agriculture should recognize the importance of teachers of agriculture and continue to nurture these relationships. In addition, the College should keep these individuals informed of program changes and related information. By maintaining a positive relationship with teachers, counselors, parents, and siblings, the College can be more effective in its recruitment efforts.

The College of Agriculture should devote adequate resources to brochure development and distribution. Over 32% of the freshmen indicated that brochures were the most helpful source of information. Campus visits and letters from staff were respectively ranked by 24% and 20.7% of the respondents as the most effective source of information. Additionally, 6.7% of the respondents indicated that personal contacts from faculty were useful. The College should continue to provide quality recruitment brochures and encourage campus visits as part of its recruitment plan.

The College of Agriculture should explore the use of alternative retention activities (such as learning communities/teams, etc.) for incoming freshmen. For those students who had decided to transfer out of the college/university, 10% indicated their reason as not feeling part of the program. While learning teams have only been in existence in the College of Agriculture for two years, anecdotal evidence indicates that these teams help ease the transition to college life by creating a "family" away from home. Further research to determine the usefulness of these teams is warranted. Likewise, a follow-up study should be conducted during respondents' senior years to determine if respondents have followed through on their stated intentions.

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Attitudes Of Iowa State University College Of Agriuclture Freshmen Toward Agriculture

A Critique

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Overview

This study reports a survey of attitudes of freshmen in the Iowa State University College of Agriculture toward agriculture and agricultural education programs. The respondents evidenced generally positive attitudes toward agriculture as a field of study, secondary-level agricultural education, the College of Agriculture in general, and their own majors in particular. They also found that students with high school agricultural education, FFA, and 4-H were more likely to graduate than students without such backgrounds.

Strengths

The authors provided an excellent review of related literature and built a solid conceptual framework for the study. They provided evidence of adequate instrumentation and mail-survey techniques. They obtained a respectable response rate and conducted an early-late respondent analysis. They provided an appropriate analysis of their data, reporting frequencies, percentages, and means, which are appropriate for a population survey.

Concerns

An early-late comparison is not as convincing as actual non-respondent follow-up; we generally see the former technique used as a substitute when more rigorous follow-up is impractical or impossible.

Questions

The study surveyed students in the College of Agriculture to determine their attitudes toward their chosen field of study. Might we not be even more interested in attitudes of other students toward agriculture?

Just over half of the students responding had taken high school agricultural education. Comparisons were made between attitudes of students who had and students who had not enrolled in high school agricultural education on a number of variables. Would we find differences in the attitudes between those two groups of students toward high school agricultural education?

Commendations

This study was rigorously designed, conducted, analyzed, and reported. In fact, it is almost a textbook case of how to conduct a mail survey, population study. Given the caution regarding lack of the true non-respondent follow-up, aspiring researchers could read this paper to see how such a population study would be conducted and reported.

Demographic Characteristics Of Preservice Teacher Education Students And Their Reasons For Majoring In Agricultural Education

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Introduction and Theoretical Framework

For years educators have heard about the changing occupation of teaching. National reports such as A Nation at Risk (1983), Tomorrow's Teachers (1986), A Call for Change in Teacher Education (1985), and A Nation Prepared: Teachers for the 21st Century (1986) chronicled the need for the recruitment of talented and committed young people to the teaching profession. A Nation at Risk (1983) suggested that not enough academically able students are being attracted into teaching; too many teachers are being drawn from the bottom quarter of high school and college student ranks.

Why should we study preservice students? Good teachers, including teacher educators, draw knowledge about their students in deciding what and how to teach (Feiman-Nemser & Remillard, 1996). Good teachers will use student data to plan their instructional activities (Howey & Zimpher, 1996). An overview of common sociodemographic characteristics in and of itself has implications not only for teacher education programming but for recruitment strategies as well (Howey, et al., 1996). Such data also has implications when teacher education programs are redesigned or restructured.

What do we know about students who major in education? Preservice students are predominately single, Caucasian females (Zimpher, 1988; Galluzzo & Arends, 1989), educated in public high schools (Book, Byers & Freeman, 1983) and receiving their K-12 education in the same school district (Book, et al., 1983). Preservice students tend to come from large families of four or more children where their mothers and fathers have earned some college credits (Book, Freeman & Brousseau, 1986). The fathers of preservice teacher education students are self-employed or employed in professional occupations and mothers are homemakers (Joyce, Yarger, Howey, Harbeck & Kluwin, 1977).

One-half of preservice students tend to commute to college, 40% transfer students from other majors or colleges, one-half attend college within 50 miles of their home (primarily rural or suburban area) (RATE, 1987), and three-fourths report outside employment while attending school (Zimpher, 1988). Many preservice teacher education students receive parental financial support as well as financial support from other sources such as loans and grants (Zimpher, 1988).

Preservice teachers tend to come from a small town background, growing up in either a rural or suburban community (Zimpher, 1988). A majority of preservice students reported that they had at least one relative in the immediate past or present generation that was or is a teacher. Researchers have identified reasons why preservice teacher education students choose to major in education. The desire to work with children (Book, et al., 1985; West & Brousseau, 1987) was a frequently cited reason by preservice teacher education students for majoring in education. Other reasons cited for majoring in education include liking the working conditions for teachers (Zimpher, 1988); liking the challenge of being a teacher (RATE, 1987; Zimpher, 1988); being influenced by significant others (RATE, 1987); loving the subject matter they were studying to teach (Kemper & Mangieri, 1985); enjoying the act of teaching (Botempo & Digman, 1985), like working with people (Joseph & Green, 1986); teaching could lead to other career opportunities (RATE, 1987), and teaching is an honorable profession (RATE, 1987; Zimpher, 1988).

There is a dearth of knowledge about the demographic characteristics of preservice students in agricultural education and why they major in agricultural education. Cole (1985) found the following in a study he conducted on preservice teacher education students in Oregon: 41% decided early in high school to major in agricultural education, males made up 73% of the preservice student population, and 60% of preservice students put themselves through college working and saving their own money. Students were less supported by their parents, loans, and scholarships, and preservice teacher education students majored in agricultural education because they were influenced by significant others (parents, teachers, and friends). Hillison, Camp, and Burke (1987) concluded from their study in Virginia that preservice teacher education students majored in agricultural education because there were opportunities to get into other careers, there were opportunities to work with young people, they were influenced by their former high school agriculture teacher to major in agricultural education, and they were influenced by their farm background and participation in FFA activities.

For years, the agricultural education profession has been faced with the problem of filling our classrooms with qualified teachers. The problem, though, has not been because universities do not prepare enough graduates to fill vacant positions, but because approximately one-half the graduates chose to enter teaching (Camp, 1997). Furthermore, agricultural education teachers taking positions now in public schools are to have stronger backgrounds in science and business to teach related aspects of agriculture to high school students (Committee on Agricultural Education in Secondary Schools, 1988). With this in mind, what kinds of students are presently being recruited and prepared in agricultural education at the preservice level? With this concern about preservice teacher education in agriculture, the American Association for Agricultural Education (AAAE) formed a work group to identify issues regarding the preservice preparation of teachers. One such issue identified what examining the characteristics of those students majoring in agricultural education. Such data would help teacher educators revise and plan preservice programs that will prepare preservice students with the proper knowledge and skills needed to be a successful teacher.

Purpose and Objectives

The purpose of this study was to collect baseline data on preservice teacher education students in agricultural education. Specific objectives of the study were to:

1. Describe preservice teacher education students in terms if their demographic characteristics
2. Identify those factors that influence preservice students to major in agricultural education
3. Determine the importance of factors influencing preservice students to major in agricultural education

Methods and Procedures

Survey research methods were used to collect data for this study. The purpose of survey research is to find out how members of a sample or population distribute themselves on a set of variables (Fraenkel & Wallen, 1996). Kerlinger (1986) commented that survey research is used to describe the present status or present an accurate description of the incidence and distribution of phenomena. In survey research, the purposes of the study are manifested in the objectives used for the study.

The population for this study was preservice teacher education students majoring in agricultural education during the 1995-96 academic year. A preservice student was defined as any agricultural education student enrolled in a preservice teacher education program at a university who had completed or was completing a professional education course in agricultural education offered by the agricultural education department or program in Spring, 1996. Since the number of preservice students in the nation was unknown, a formula recommended by Cochran (1963) was used to determine the sample sized needed for the study. The number of preservice teacher education students needed for the study, based on a 95% confidence level, was 384.

A cluster sampling procedure was used to select preservice teacher education students for the sample. Cluster sampling is appropriate to use in educational settings when it is impossible to select a random sample of individuals (Fraenkel & Wallen, 1996). Cluster sampling is also easier to implement and is less time-consuming. Cluster sampling also has the disadvantage of selecting a sample that will not be representative of the population.

Departments/programs offering degree certification programs in agricultural education were randomly selected. A contact person in the department/program was called to determine if they would be willing to assist in collecting data for the study. If the individual was willing to assist the researcher in collecting data, the number of preservice students available to collect data on was determined. This procedure was followed until the desired sample size was obtained. Twenty departments/programs providing 481 preservice students were included in the study.

The questionnaire used to collect data consisted of three parts, of which data from parts one and three are reported in this paper. Part one contained 37 Likert-type statements asking preservice students to indicate how important each statement was in their decision to major in agricultural education. The final part collected demographic information on preservice students.

The questionnaire was field tested for content and face validity with a group agricultural education faculty members. The questionnaire was pilot tested for reliability with a group of student teachers (n = 18) not included in the study. A test-retest reliability coefficient of .76 was calculated on part one of the questionnaire, acceptable according to Nunnally and Bernstein (1994).

To collect data on preservice students, the contact person in departments/programs agreeing to collect data were mailed a packet containing the correct number of questionnaires needed for the department/program. A total of 481 questionnaires was sent to 20 departments/programs. Instructors were asked to administer the questionnaire during one class meeting. Instructors then returned the questionnaires to the researcher. A total of 272 usable questionnaires was returned for a response rate of 57%. Because a number of questionnaires were returned uncompleted and there was no way to conduct appropriate follow-up procedures to control for non-response, the results of the study can only be generalized to the 272 preservice students who provided usable data.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS Version 6.1 for Windows). Descriptive statistics, including frequencies, percentages, means, medians, modes, ranges, and standard deviations, were used to organize, summarize, and analyze data. Principal components factor analysis with oblique rotation reduced the number of statements into a common set of factors to explain how important reasons were in preservice students' decisions to major in agricultural education.

Results

Demographic Characteristics

Table 1 reports categorical demographic characteristics of preservice students. Fifty-eight percent were male and 42% were female. The average preservice student was 23.5 years old (range from 18 to 55 years) with male preservice students being 24.1 years old and female preservice students being 22.8 years old. Eighty-three percent were single, 14% married, 2% divorced, and 1% separated. The ethnic composition of preservice students was 82% Caucasian, 8% African-American, and 8% percent Hispanic, Asian American/Pacific Islander, or another ethnicity. Caucasian males accounted for 46% of the responding sample while Caucasian females made up 38%. Ethnic minority males made up 11% of the responding sample while ethnic minority females made up 5%.

Table 1 Demographic Characteristics of Preservice Students (n = 272)

Characteristic	Frequency	Percentage
Gender		
Male	157	58
Female	115	42
Marital Status		
Single	226	83
Married	39	14
Divorced	5	2
Separated	1	1
Ethnic Background		
Caucasian	227	82
African-American	23	8
Hispanic	7	3
Other Ethnicity	6	2
Mixed Ethnicity	4	2
Asian American/Pacific Islander	1	1
Not Reported	4	2
FFA Involvement*		
FFA member	174	64
Local FFA chapter officer	136	50
State FFA officer	22	8
4-H Involvement*		
4-H club member	131	48
4-H club officer	94	35
Experiences With Youth and Children*		
Sunday school teacher	97	36
Camp counselor	86	32
4-H volunteer	94	35
Baby-sitter	135	50
Teacher's Aide	105	39
Transferred from Another College of Changed Majors*		
Transferred from junior/community college	90	33
Transferred from another college/university	48	18
Changed majors in college	109	40
Community Backgrounds		
Village (less than 5,000 people)	106	39
Small Town (5,000 – 9,999 people)	62	23
Town (10,000 – 49,999 people)	49	18
Small City (50,000 – 99,999 people)	28	10
City (100,000 – 499,999 people)	16	6
Large/Metropolitan Cities (over 500,000 people)	11	4

*Note: Preservice students could respond yes to each response.

Sixty-four percent of the preservice students were former FFA members, 50% served as a local FFA chapter officer, and 8% served as a state FFA officer. Forty-eight percent were active members of 4-H while growing up, with 35% of the respondents indicating they served as a 4-H club officer.

Preservice students were asked to indicate what type of prior experiences they had working with children and youth. Fifty percent had been a baby-sitter, 39% a teacher's aide, 36% a Sunday school teacher, 35% a 4-H volunteer, and 32% a camp counselor. Thirty-five percent indicated they had additional experiences working with children or youth other than those mentioned above. Some of these experiences included serving as a volunteer at FFA activities and coaching athletic events.

One-third (33%) of the preservice students had transferred from a junior or community college to their present institution. Eighteen percent had transferred from another four-year college or university. Four out of every 10 respondents had changed majors in college to their present major of agricultural education.

Sixty-two percent of preservice students grew-up in either a village or small town atmosphere (less than 10,000 people). Ten percent grew up in cities with populations over 100,000 people. Eighty-two percent were raised in a family with two natural parents, 8% in a one-parent family resulting from divorce, 4% in a family with a natural parent married to a step parent, 4% in a family where they were raised by a single parent or grandparents, and 3% in a one-parent family resulting from death of a parents. The average number of siblings of preservice students was 2.3 with a range of 0 to 10 siblings.

Eighty-six percent of the fathers and 93% of the mothers of preservice students had at least a high school education. The fathers of preservice students worked primarily in professional, managerial and technical careers (29%); agriculturally related careers (25%), or structural work (13%). Mothers of preservice students worked primarily in professional, technical and managerial careers (38%); clerical and sales careers (22%), or as homemakers (17%).

Forty-four percent of preservice students attended a college more than 150 miles from home, 35% attended college 50 to 150 miles from home, and 21% attended college less than 50 miles from home. While attending college, preservice students primarily in non-university housing, either in apartments (41%) or some other type of off-campus housing (29%).

To finance their college education, preservice students relied upon, loans (54%), part-time work (52%), parental support (45%), and scholarships (42%). The least utilized sources of financial aid included full-time work (8%) and college work study (12%).

Reasons for Majoring in Agricultural Education

Principal components factor analysis with oblique rotation was used to reduce the 37 statements in part one of the questionnaire into a set of factors to identify why preservice students major in agricultural education. Respondents answered individual items using the Likert-type scale 1 = Unimportant, 2 = Of Little Importance, 3 = Moderately Important, 4 = Important, and 5 = Very Important. Five factors, accounting for 51% of the variance, were extracted. For the sample size of the study, factor loadings above .30 (absolute value) were used to identify variables that loaded on each factor (Hair, Anderson, Tatham & Black, 1996).

Table 2 indicated the factor loadings of the 32 items that were retained as well as the Cronbach's alpha coefficients for each of the five factors. The Cronbach's alpha coefficients, indicating the internal consistency of the variables on each factor, were acceptable according to Nunnally & Bernstein (1994).

The following factors were extracted and named as follows:

Factor 1: Mission of Agricultural Education - working with high school students, teaching the less fortunate, gaining a sense of personal achievement, and accepting the challenge of being a teacher.

Factor 2: External Benefits - working hours, working conditions, extended contracts, income and vacations associated with agricultural education teachers.

Factor 3: Goal Satisfaction - preservice students wanting to be an agricultural education teacher and work with students in the FFA

Factor 4: Service Orientation - family and community service teachers provide as well as preservice students receiving encouragement to enter the profession

Factor 5: Personal Satisfaction - having the lifelong opportunity to learn, wanting to work in schools with high school students and enjoying teaching

Table 2 Factors Influencing Individuals to Major in Agricultural Education

Factor Statement	Factor Loading	Cronbach's Alpha
Factor 1 - Mission of Agricultural Education		.85
I want to apply what I have learned from studying agriculture.	.67	
Teaching is an opportunity to help others less fortunate than myself.	.63	
Being an agricultural education teacher would allow me to be creative.	.62	
I want to help others gain knowledge of things I consider important.	.62	
I like to learn by doing.	.61	
I want to help students develop a sense of excitement about learning new things.	.59	
I want to gain a sense of personal achievement.	.58	
I want to help students gain a sense of self esteem.	.55	
Being an agricultural education teacher would be challenging.	.36	
Factor 2 - External Benefits		.81
Teachers are not required to work holidays.	.72	
Agricultural education teachers receive extra income during the summer months on an extended contract.	.71	
Teaching would allow me to have job/financial security.	.68	
I like the working hours for agricultural education teachers.	.61	
I find the income from teaching to be adequate.	.55	
I like the working conditions for agricultural education teachers.	.47	
Factor 3 - Goal Satisfaction		.71
I have always wanted to be an agricultural education teacher.	.78	
I have always wanted to study agriculture.	.71	
I want to work with students in the FFA.	.66	
I was influenced by a former teacher to major in agricultural education.	.57	
Factor 4 - Service Orientation		.74
Being an agricultural education teacher will help me prepare for family life.	.62	
I was influenced by family members to major in agricultural education.	.61	
Teaching will allow me to provide service to society.	.56	
I was influenced by friends to major in agricultural education.	.54	
I was able to be admitted into the teacher education program.	.51	
Teaching can be a way to give back to my community.	.47	
Factor 5 - Personal Satisfaction		.80
I enjoy teaching.	-.73	
I am interested in working with high school students.	-.70	
I want to help students gain a sense of personal achievement.	-.52	
I want to help high school students learn about agriculture.	-.50	
Teaching is an honorable profession.	-.49	
I enjoy being associated with schools.	-.44	
Being an agricultural education teacher is a lifelong opportunity to learn.	-.35	

Scale: 1.00 - 1.49 = Unimportant, 1.50 = 2.49 - Of Little Importance, 2.50 - 3.49 = Moderately Important, 3.50 - 4.49 = Important, 4.50 - 5.00 = Very Important

Table 3 presents the means and standard deviations for the five factors influencing preservice students to major in agricultural education. Factor means ranged from a low of 3.07 on the Service Orientation Factor (standard deviation = .87) to a high of 4.12 on the Mission of Agricultural Education Factor (standard deviation = .56). The following real limits were used to interpret the importance of the factors: Scale: 1.00 - 1.49 = Unimportant, 1.50 = 2.49 - Of Little Importance, 2.50 - 3.49 = Moderately Important, 3.50 - 4.49 = Important, and 4.50 - 5.00 = Very Important.

Conclusions/Implications/Recommendations

The data and information presented in this paper provide baseline data on preservice students in agricultural education in the United States. The results of this study are intended to overcome the lack of knowledge about where, what, how, to whom, and by whom agriculture teacher education is provided. It is hoped that the data and information will initiate a framework for future research efforts that will improve and strengthen the role and effectiveness of agriculture teacher education.

Based on the results of this study, the following conclusions are offered:

1. The typical preservice student in agricultural education is a single, Caucasian male 24 years old from a community of less than 10,000 people. He was raised in a traditional two-parent family and has 2 siblings.
2. The typical preservice student in agricultural education is a former FFA member and local chapter FFA officer.
3. The fathers and mothers of a typical preservice student in agricultural education have a high school education, with the fathers being employed either in professional or agricultural careers and the mothers being employed in either professional or clerical and sales careers.
4. Less than 50 percent of preservice students in agricultural education have prior experiences working with youth or children before attending college or while attending college.
5. Preservice students perceive it important to major in agricultural education in order to be involved with the mission of agricultural education, working with high school students and teaching those who are less fortunate.
6. Preservice students perceive it important to major in agricultural education because it will be personally satisfying to them to work with high school student and to have the lifelong opportunity to learn as a teacher.
7. Preservice students perceive it as important to major in agricultural education because it will achieve their goal of wanting to be an agricultural education teacher and to work with students in the FFA.
8. Preservice students perceive the external benefits and the opportunity to provide a service as moderately important to be an agricultural education teacher.

Preservice teacher education programs in agriculture still lack minority candidates, particularly those from different ethnic backgrounds. Are we in the agricultural education profession recruiting candidates from different ethnic backgrounds? What type of recruitment activities are we conducting to attract such candidates? If the profession is to attract outstanding ethnic minorities into the teaching profession, recruitment activities must be developed to attract such candidates to agricultural education programs.

Four out of every 10 respondents in this study had changed their majors to agricultural education at some point in their college career. Furthermore, one out of every three had transferred from a community college to major in agricultural education? What could be the reasons for such changes and transfers? Research should be conducted to determine why these individuals decide to change their major and/or transfer into agricultural education. Results from this research should help agricultural education departments/programs plan recruitment activities to attract prospective students.

Many preservice students in agricultural education do not have any prior experiences working with youth and children. As we prepare these students for teaching careers, what kinds of experiences would be want preservice students to have before entering the teaching profession? Department and programs in agricultural education should determine what kinds of experiences are needed by preservice students and should incorporate these experiences in early field experiences and/or student teaching to make sure preservice students have an adequate opportunity to work with different kinds of students.

While this study provides a good foundation from which to look at agriculture teacher education, further research needs to be conducted in the following areas:

1. Replicate this study every five years to ascertain the status of the profession and to determine trends regarding preservice students in agricultural education.

2. Determine reasons why minority students in high school agricultural education do not major in agricultural education in college.

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Demographic Characteristics Of Preservice Teacher Education Students And Their Reasons For Majoring In Agricultural Education

A Critique

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Overview

This paper reports the results of a mail survey study of agricultural teacher education students in the United States. The researcher found that agricultural teacher education students are predominately male, Caucasians who had been enrolled in agricultural education in high school. Factor analysis revealed that the major reasons for the students having selected agricultural education as a major centered around the profession's mission, external benefits, goal satisfaction, service orientation, and personal satisfaction.

Strengths

This paper provides an excellent literature review and a solid conceptual framework for the study reported. The population was adequately defined and an appropriate sample was selected and surveyed. The instrument was adequately developed, validated, and field tested. Adequate test-retest reliability was established. After the data collection, factor analysis was used to collapse the instrument into a more manageable form and internal consistency coefficients were reported for the derived factors. The data were analyzed appropriately and reported in a cogent manner.

Concerns

A significant procedural problem developed when a follow-up of non-respondents was impossible. The researcher recognized and acknowledged this problem. The second-best solution of early-late respondents such as reported in the Andreasen, Brja, and Dyer student would have been useful in this situation, if return dates were recorded. If those dates were not recorded, we can learn from that omission.

Questions

We now know what typical preservice agricultural teacher education students are like, but related, more important questions remain unanswered. How can we retain a higher proportion of students? What can we do to increase the percentage of graduates who seek to enter teaching? Are there regional differences in preservice student demographics?

Commendations

The researcher demonstrated an excellent understanding of how to design, conduct, analyze, and report a survey research study. As with the population study previously reported by Andreasen, Breja, and Dyer, aspiring researchers could reach this paper as a primer on how to conduct survey research involving a sample, again given the caution regarding lack of non-respondent follow-up.

Differences In Reasons Why Individuals Choose To Become Agricultural Teacher Educators By Demographic Characteristics

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Introduction and Theoretical Framework

The quality of any teacher education program is dependent on the quality of its professoriate - the men and women who develop, implement, and evaluate teacher education programs (Troyer, 1986). Yet, it was not until the 1960s that one began to find literature about members of the education professoriate (Howey & Zimpher, 1990).

Cruickshank (1984) documented reasons for so little research on teacher education and the education professoriate has been "the lack of aptitude for or training in the inquiry by teacher education; the absence of time, support, and reward for inquiry; and the absence of vehicles that encourage and transmit scholarly knowledge" (p. 45). He proposed a model to help guide research and inquiry in teacher education, with one component looking at members of the education professoriate. Specific variables that could be studied on teacher educators included formative influences such as family background and socioeconomic backgrounds, personal characteristics, and professional characteristics and abilities (Cruickshank, 1990).

There are a number of reasons to inquire about the merits of the education professoriate (Ducharme & Ducharme, 1996). The history of teacher education's presence in higher education is ambiguous and in need of clarification with continuous debates about the place teacher education has in higher education and the role and status of teacher educators. Furthermore, because of close ties to elementary and secondary education, expectations of those as public school teachers influence the roles and responsibilities of teacher educators. With the continuous criticism of American public education in the past decade, even though there has been a connection between what occurs in schools and teacher preparation, the lack of knowledge about who educates teachers is still non-existent (Goodlad, 1990).

Demographic characteristics of teacher educators include such characteristics as gender, ethnicity, age, academic rank, length of teaching contract, marital status, and number of dependents under the age of 21 (McCullough, 1992). Troyer (1986) found that there were more males than females in the education professoriate. Ducharme, et al. (1996) found that teacher educators were white males in their late forties or early fifties, tenured at either the full or associate professor level. Women constitute approximately 28% of the education professoriate, yet only make up 12% of the faculty at the rank of full professor (AACTE, 1988). Women will also tend to publish less because they generally assume more supervisory and teaching responsibilities than do males in the education professoriate (Ducharme, et al. 1996). Ethnic minorities account for less than 10% of the education professoriate and the future does not hold much promise for adding minorities to the education professoriate because less than 8% of doctoral students were minority (AACTE, 1987). Lynch (1990) found that more members of the vocational teacher education professoriate were middle-aged Caucasian males holding the rank of professor or associate professor and having tenure.

Individuals chose to become teacher educators for a variety of reasons. Carter (1981) found that individuals chose to become teacher educators because they drifted into college teaching, they wanted to work with college aged students, and they wanted jobs with security and prestige. Other commonly cited reasons for entering the education professoriate included the desire to make a difference in education, enjoyment of teaching, intellectual stimulation, lifestyle of a college teacher, encouragement and influence of others, and status and prestige of the profession (Burch, 1989).

McCullough (1992) conducted a study with doctoral students on why they wanted to become a teacher educator and identified seven reasons for wanting to become a teacher educator. These reasons included personal and professional development, adult environment and pedagogy, meaningful contributions to the education field, external benefits, people targets, influence of significant others, and dissatisfaction in the K-12 position.

What does the future hold for the education professoriate in agricultural education? Where would we like to be in the coming years regarding the make-up of faculty and staff preparing the agriculture teachers of tomorrow? To know where we want to be, we must look at where we are today to see how far off are from the ideal picture we have about teacher education. However, no research exists in agricultural education from which we can establish as a baseline for our profession. There is potential in teacher education, but we must show more unity, more understanding of the problems and issues of modern American society, more demonstrated effectiveness in bringing about desired outcomes in teacher education graduates, and more imagination in bridging the world of today's youth (Ducharme, et al, 1996). Members of the education professoriate must provide this leadership.

Purpose and Objectives

The purpose of this study was to collect baseline data on teacher educators in agricultural education. Specific objectives of the study were to:

1. Describe teacher educators in terms of their demographic characteristics
2. Identify factors that best discriminate teacher educators on selected demographic characteristics

Methods and Procedures

The population for this descriptive correlational study was all teacher educators employed in departments and program areas at colleges and universities in the United States during the 1995-96 academic year offering degree certification programs in agricultural education. A teacher educator was defined as an individual employed full-time by the university who taught preservice professional education courses in agricultural education or had supervised preservice students in early field experiences or student teaching internships within the past two years. Department heads/programs chairs were contacted and asked to identify those faculty members within their department who met these criteria. Two-hundred seven teacher educators were identified and surveyed in the study.

Questions for the questionnaire were adapted from McCullough's (1992) study on prospective teacher educators. The questionnaire consisted of six parts, of which only data from parts one and six are reported in this paper. Part one contained 50 Likert-type statements for teacher educators to indicate how important each statement was in their decision to become a teacher educator. The sixth part collected demographic information on teacher educators. The questionnaire was field and pilot tested for content and face validity and reliability with a group of vocational teacher educators (n = 11) not associated with agricultural education. A test-retest reliability coefficient of .73 was calculated on part one of the questionnaire, acceptable according to Nunnally and Bernstein (1994).
From the 50 statements in part one, factor analysis and Cronbach's alpha coefficients were used to develop scales to identify reasons why individuals chose to become teacher educators. Seven scales were developed

with a range of Cronbach's alpha coefficients from .79 to .89 with two to 11 items per scale. Respondents answered individual items using the Likert-type scale 1 = Unimportant, 2 = Of Little Importance, 3 = Moderately Important, 4 = Important, and 5 = Very Important. Therefore, the higher the scale score the more important the respondent perceived that scale as a reason for becoming a teacher educator.

Seven scales were developed to identify reasons for becoming a teacher educator. The External Benefits scale (11 items) measured the importance of the working conditions of teacher educators, salaries, opportunities for travel, and demand for teacher educators in the profession. The Teaching and Pedagogy scale (5 items) determined how important it was for teacher educators to work with preservice students on pedagogy, share an interest in pedagogy, and have an impact on the field of education. The Influence of Significant Others scale (4 items) measured the importance of people who encouraged respondents to become teacher educators. The scale Dissatisfaction With Prior Positions (6 items) measured the dissatisfaction in teaching/administrative positions, dislike working with K-12 students or in a K-12 setting, and being bored with past levels of educational attainment. The Personal and Professional Development scale (7 items) measured the importance of teacher educators wanting to make better use of their professional abilities, to become more deeply challenged, and to satisfy the need to accomplish something of value. Scale number six, Contribution to Teacher Education (2 items), measured how important it was for teacher educators to contribute to the knowledge base of teacher education through research and answer specific research questions. The final scale, People Target (5 items) indicated how important it was for teacher educators to help minorities and other talented individuals to enter teaching as well as to help minorities assume leadership roles in teacher education.

Appropriate mailing and follow-up procedures, as outlined by Salant and Dillman (1994) were used in the study. A total of 178 of 207 questionnaires were returned with usable data for a response rate of 86%. To address non-response error, 10 teacher educators who had not responded were contacted and asked a set of purposefully selected questions. Responses from non-respondents were compared to respondents and no significant differences were found, thus allowing the results to be generalized to the population.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS Version 6.1 for Windows). Descriptive parameters, including frequencies, percentages, means, medians, modes, ranges, and standard deviations, were used to organize, summarize, and analyze data. Discriminant analysis was used to compare factors for becoming a teacher educator by selected demographic variables. The discriminating variables were the seven factors for becoming a teacher educator. Standardized discriminant function coefficients were used to indicate the relative importance of the discriminating variables on each categorical variable. Pooled within group structure coefficients were used to indicate how the discriminating variables and discriminant functions were correlated within groups. Alpha levels were set at .05 a priori to determine any significant differences.

Results

Demographic Characteristics

Table 1 reports categorical demographic characteristics of teacher educators. Sixty-eight percent of teacher educators were employed at 1862 land grant colleges, 8% were employed at 1890 land grant colleges, and 24% were employed at non-land grant colleges. Teacher educators were, on average, 48.1 years old (range from 29 to 67 years of age) with male teacher educators being 48.6 years old and female teacher educators being 41.6 years old.

Ninety-three percent of the teacher educators were male and 7% were female. Eighty-five percent of teacher educators were married, 6% single, 5% divorced, 1% separated, and 1% widowed. The ethnic composition of teacher educators was 86% Caucasian, 7% African-American, and 5% percent Hispanic, Asian American/Pacific Islander, or another ethnicity. Caucasian males accounted for 81% of teacher educators while Caucasian females made up 7%. Ethnic minority males made up 12% of teacher educators while there were no ethnic minority females in the education professoriate.

Forty-five percent of teacher educators held the rank of professor, 26% the rank of associate professor, 20% the rank of assistant professor, and 6% were instructors or lecturers. Seventy-one percent of the professoriate were tenured, 17% were non-tenured but employed in tenure-line positions, 6% were employed in non-tenure track positions but had relatively secure continuous employment and 4% were ineligible for tenure in their current position. Fifty-seven percent of the professoriate was employed on 12-month contracts, 32% on 9-month contracts, 5% on 10-month contracts, and 4% on 11-month contracts.

Distinguishing Teacher Educators on Selected Demographic Variables

To determine differences between reasons individuals chose to become teacher educators and demographic characteristics reported in Table 1, discriminant analysis was used. Only those discriminant functions that were significant ($p < .05$) are reported. Univariate statistics (means and standard deviations) were reported by demographic characteristics for each discriminating variable. Standardized canonical discriminant function coefficients (b) were interpreted using the rule those coefficients whose absolute value is not less than one-half of the largest value are considered important in the discriminant function (Hair, Anderson, Tatham & Black, 1996). Pooled within group structure coefficients (s) above .30 (absolute) were considered important (Hair, et al., 1996).

Type of Institution Where Employed

For the demographic characteristic type of institution where employed, teacher educators employed at 1890 institutions had significantly higher means than teacher educators employed at both 1862 institutions and non-land grant institutions on the following discriminating variables: external benefits, contribution to teacher education, and people target (Table 2). Furthermore, teacher educators employed at 1862 institutions had significantly higher means than teacher educators employed at non-land grant institutions on the discriminating variable contribution to teacher education.

Because there were three levels of the categorical variable, two discriminant functions could be significant for classifying teacher educators by type of institution where employed. The following null hypothesis was tested on discriminant function one for type of institution where employed: There is no difference between 1862 institutions, 1890 institutions and non-land grant group centroids on the discriminant score. A Wilks' lambda of .7160 and chi-square of 51.13 were reported with 14 degrees of freedom. The chi-square was significant at $p < .05$; therefore the null hypothesis was rejected. There was a significant difference between the group centroids of teacher educators employed at 1862 institutions, 1890 institutions, and non-land grant institutions.

Table 1 Demographic Characteristics of Teacher Educators (n = 178)

Characteristic	Frequency	Percentage
Type of Institution Where Employed		
1862 Land Grant	121	68
1890 Land Grant	14	8
Non Land Grant	43	24
Gender		
Male	165	93
Female	13	7
Marital Status		
Married	153	85
Single	10	6
Divorced	9	5
Separated	1	1
Widowed	1	1
Not Reported	4	2
Ethnic Background		
Caucasian	154	86
African-American	13	7
Other Ethnicity	4	2
Hispanic	3	2
Asian American/Pacific Islander	1	1
Not Reported	3	2
Academic Rank		
Professor	81	45
Associate Professor	49	28
Assistant Professor	36	20
Instructor/Lecturer	10	6
Not Reported	2	1
Tenure Status		
Tenured	128	71
Non-tenured, but in tenure line position	30	17
Non-tenured, but in non-tenure line position	10	6
Ineligible for tenure	7	4
Not reported	3	2
Length of Annual Contract		
12 months	103	57
9 month	57	32
10 month	8	5
11 month	7	4
Not Reported	3	2

Table 2 Means and Standard Deviations Describing Teacher Educators by Type of Institution Where Employed on Seven Discriminating Variables

	1862		1890		Other		
Discriminating Variable	M	SD	M	SD	M	SD	F
External Benefits	3.00	.80	3.58	.82	3.29	.92	3.97*
Teaching and Pedagogy	3.99	.68	4.09	.72	3.98	.78	.14
Influence of Significant Others	3.70	.96	3.92	.79	3.69	1.06	.33
Dissatisfaction With Prior Positions	1.90	.87	2.44	.77	1.92	.80	2.48
Personal and Professional Development	3.82	.72	4.24	.72	3.69	.80	2.72
Contribution to Teacher Education	3.05	1.02	3.84	1.05	2.33	.94	13.52*
People Target	2.84	.79	3.89	.81	2.93	.69	10.73*

*$p<.05$

The standardized canonical discriminant function coefficients, indicating the relative importance of each discriminating variable in discriminant function one, are shown in Table 3. The discriminating variables contribution to teacher education (b = .80), teaching and pedagogy (b = -.45), and people target (b = .43) were the most important variables in discriminant function one. Interpreting the pooled within group structure coefficients, contribution to teacher education (s = .84) and people target (s = .53) were the variables that loaded high on discriminant function one.

Table 3 Summary Data for Discriminant Function One Describing Teacher Educators by Type of Institution Where Employed

	Function 1		Group Centroids	
Discriminating Variables	b	s		
External Benefits	-.35	.08	1862	.075
Teaching and Pedagogy	-.45	.08	1890	1.257
Influence of Significant Others	.06	.11	Other	-.624
Dissatisfaction With Prior Positions	.14	.27		
Personal/Professional Development	.29	.37		
Contribution to Teacher Education	.80	.84		
People Target	.43	.53		

b = standardized discriminant function coefficients, s = within-group structure coefficients

The same null hypothesis was tested on discriminant function two for type of institution where teacher educators were employed. A Wilks' lambda of .8755 and chi-square of 21.52 were reported with 6 degrees of freedom. The chi-square was significant at $p < .05$; therefore the null hypothesis was rejected. There was a significant difference between the group centroids of teacher educators employed at 1862 institutions, 1890 institutions, and non-land grant institutions for discriminant function two.

The standardized canonical discriminant function coefficients indicating the relative importance of each discriminating variable in discriminant function two for type of institution where employed are shown in Table 4. The discriminating variables people target (b = .85), external benefits (b = .58), and contribution to teacher education (b = -.51) had the most importance in discriminant function two. Interpreting the pooled within group structure coefficients, external benefits (s = .69) and people target (s = .57) were the variables that loaded high on the discriminant function two. As a result of the two discriminant functions, 60% of the teacher educators were correctly classified by the type of institution where employed.

Table 4 Summary Data for Discriminant Function Two Describing Teacher Educators by Type of Institution Where Employed

	Function 2			
Discriminating Variables	b	s	Group Centroids	
External Benefits	.58	.57	1862	-.246
Teaching and Pedagogy	-.17	.05	1890	.811
Influence of Significant Others	-.20	.10	Other	.445
Dissatisfaction With Prior Positions	.15	.31		
Personal/Professional Development	-.20	.12		
Contribution To Teacher Education	-.51	-.20		
People Target	.85	.69		

b = standardized discriminant function coefficients, s = within-group structure coefficients

Gender

For the demographic characteristic gender, male teacher educators had significantly higher means than female teacher educators on the discriminating variable teaching and pedagogy (Table 5).

The following null hypothesis was tested: There is no difference between female teacher educator and male teacher educator group centroids on the discriminant score. A Wilks' lambda of .8905 and chi-square of 18.84 were reported with 7 degrees of freedom. The chi-square was significant at $p < .05$; therefore the null hypothesis was rejected. There was a significant difference between the group centroids of female teacher educators and male teacher educators.

The standardized canonical discriminant function coefficients, indicating the relative importance of each discriminating variable in the discriminant function, are shown in Table 6. The discriminating variables teaching and pedagogy ($b = 1.00$), external benefits ($b = .72$), and personal and professional development ($b = -.71$) had the most importance in the discriminant function. Interpreting the pooled within structure coefficients, teaching and pedagogy ($s = .64$) was the only variable that loaded high on the discriminant function. As a result of the discriminant function, 77% of the teacher educators were correctly classified by gender.

Ethnicity

For the demographic characteristic ethnicity, minority teacher educators had significantly higher means than Caucasian teacher educators on the following discriminating variables: contribution to teacher education and people target (Table 7).

Table 5 Means and Standard Deviations Describing Teacher Educators by Gender on Seven Discriminating Variables

	Female		Male		
Discriminating Variable	M	SD	M	SD	F
External Benefits	2.80	.85	3.13	.84	1.54
Teaching and Pedagogy	3.41	1.04	4.04	.66	8.29*
Influence of Significant Others	3.82	.81	3.71	.98	.14
Dissatisfaction With Prior Position	2.03	.81	1.94	.86	.11
Personal and Professional Development	3.99	.96	3.81	.73	.54
Contribution to Teacher Education	2.81	1.17	2.95	1.07	.16
People Target	2.98	.94	2.94	.81	.02

$^{*}p<.05$

Table 6 Summary Data for Discriminant Function Describing Teacher Educators by Gender

Discriminating Variables	Function b	s	Group Centroids	
External Benefits	.72	.27	Female	-1.317
Teaching and Pedagogy	1.00	.64	Male	.092
Influence of Significant Others	-.12	-.08		
Dissatisfaction With Prior Positions	-.16	-.07		
Personal/Professional Development	-.71	-.16		
Contribution to Teacher Education	.08	.09		
People Target	-.46	-.03		

b = standardized discriminant function coefficients, s = within-group structure coefficients

The following null hypothesis was tested: There is no difference between minority teacher educator and Caucasian teacher educator group centroids on the discriminant score. A Wilks' lambda of .8011 and chi-square of 35.81 were reported with 7 degrees of freedom. The chi-square was significant at $p < .05$; therefore the null hypothesis was rejected. There was a significant difference between the group centroids of minority teacher educators and Caucasian teacher educators.

The standardized canonical discriminant function coefficients, indicating the relative importance of each discriminating variable in the discriminant function, are shown in Table 8. The discriminating variable people target (b = 1.08) had the most importance in the discriminant function. Interpreting the pooled within structure coefficients, people target (s = .79) was the only variable that loaded high on the discriminant function. As a result of the discriminant scores, 89% of the teacher educators were correctly classified by ethnicity.

Table 7 Means and Standard Deviations Describing Teacher Educators by Ethnicity on Seven Discriminating Variables

	Minorities		Caucasians		
Discriminating Variable	M	SD	M	SD	F
External Benefits	3.09	1.00	3.11	.82	.01
Teaching and Pedagogy	4.08	.733	.97	.70	.40
Influence of Significant Others	3.70	1.01	3.71	.96	.00
Dissatisfaction With Prior Position	2.03	.83	1.93	.86	.28
Personal and Professional Development	3.76	.97	3.84	.70	.22
Contribution to Teacher Education	3.52	1.13	2.86	1.05	7.49*
People Target	3.72	.88	2.83	.74	25.77*

*p<.05

Table 8 Summary Data for Discriminant Function Describing Teacher Educators by Ethnicity

Discriminating Variables	Function b	s	Group Centroids	
External Benefits	-.23	-.02	Minorities	1.271
Teaching and Pedagogy	-.35	.10	Caucasian	-.192
Influence of Significant Others	-.16	.00		
Dissatisfaction With Prior Positions	-.04	.08		
Personal/Professional Development	-.30	-.07		
Contribution to Teacher Education	.35	.43		
People Target	1.08	.79		

b = standardized discriminant function coefficients, s = within-group structure coefficients

Conclusions/Implications/Recommendations

The typical teacher educator in agricultural education is a married, middle-aged Caucasian male who is employed at an 1862 land grant institution, having tenure, holding the rank of professor and having a 12 month contract. Research shows that there are differences in the reasons why individuals choose to become teacher educators based upon selected demographic characteristics. Using the standardized discriminant function coefficients and the within group structure coefficients, teacher educators employed at 1890 land grant institutions perceive it important make a contribution to teacher education, influence minorities to become teacher educators, to assume a leadership role in teacher education, and enjoy the benefits associated with being a teacher educator. Teacher educators employed at 1862 land grant institutions perceive it important to make a contribution to the teacher education profession through research. Teacher educators employed at non land grant institutions perceive it important to share their interest in pedagogy and to make an impact in the field of education.

Males tend to enter the teacher education profession because they what to share their interest in pedagogy and to receive the external benefits associated with being a teacher educator. Females tend to enter the teacher education profession to take advantage of the personal and professional development opportunities available to them.

Minorities enter the education professoriate because they want to influence minorities to enter the teaching profession and to assume a leadership role in the teacher education profession.

If teacher education is to make an impact in the future of public and higher education in agriculture, teacher educators will be responsible for providing the leadership to make such changes. As agricultural education continues to expand into non-traditional arenas, who will provide this leadership? Agricultural education departments/programs should make efforts to diversify their faculty by hiring individuals who can bring different areas of expertise to departments/programs to broaden the base of agricultural education and provide a range of opportunity to diversify and collaborate with other fields of education.

If teacher education is to increase the number of minority teacher educators (both ethnic and gender minorities) and minority teachers of agriculture, teacher education must have role models in the profession. Agricultural education departments and program areas must make efforts to diversify their faculties and recruit and select minority candidates into the professoriate. A way of accomplishing this is to provide opportunities and attract outstanding minority teachers (ethnic and gender) into doctoral programs and prepare these individuals to assume a leadership role in teacher education in agriculture.

While this study provides a good foundation from which to look at agriculture teacher education, further research needs to be conducted in the following areas:

1. Replicate this study every five years to ascertain the status of the profession and to determine trends regarding the education professoriate in agriculture

2. Determine how satisfied teacher educators are in higher education and with their current roles and responsibilities in teacher education

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Concurrent Session F

Theme:
Agricultural Mechanization

Chairperson:
Glen Miller
University of Arizona

Discussant:
Greg Miller
Iowa State University

Facilitator:
Joe A. Gliem
Ohio State University

An Assessment of Agriculture Teachers' Needs Regarding Safety Instruction
Bryan L. Garton, University of Missouri
Robin W. Thompson, Univ. of Missouri

Laboratory Safety Inservice Needs of Texas Agricultural Science Teachers
Brent McDonald
Wilson High School ~ Wilson, Texas
David E. Lawver, Texas Tech University

Preservice and Inservice Agricultural Mechanization/Engineering Needs for First Year Agricultural Science Teachers in Texas
Kyle W. McGregor
Wellman-Union HS ~ Wellman, Texas
David E. Lawver, Texas Tech University

The Role of Agricultural Mechanization in the Secondary Agricultural Education Curriculum as Viewed by Agricultural Educators
Carlos Rosencrans, Jr., New Mexico State
Robert A. Martin, Iowa State University

An Assessment of Agriculture Teachers' Needs Regarding Safety Instruction

Bryan L. Garton
University of Missouri

Robin W. Thompson
University of Missouri

Introduction/Theoretical Framework

In 1994, the Extension Service at the University of Missouri launched a statewide agricultural safety effort entitled "TASK: *Teaching Agricultural Safety to Kids.*" Funded as a three-year pilot project by the National Institute of Occupational Safety and Health, TASK was a youth-teaching-youth approach to safety education that carried a goal of reducing youth injury and death rates in rural areas of the state. As part of the project, adolescents attended an extensive orientation workshop, where secondary agriculture teachers and other volunteers prepared the adolescents for their teaching role with younger children. Viewed as a key component to the "success" of the program, the secondary agriculture teachers were responsible for providing technical knowledge to the adolescents regarding agricultural safety and methods for teaching agricultural safety to others.

However, during the second year of the project, the TASK staff identified numerous questions regarding the secondary agriculture teachers. These questions included: Who teaches agricultural safety to adolescents, and what are their qualifications? What safety topics do teachers feel they need to teach students? What curriculum or resource materials do teachers need to teach agricultural safety and health effectively?

Published information was limited on the qualifications, interests, and curricula needs of secondary agriculture teachers relative to teaching agricultural safety. In 1993, Pierson conducted a needs assessment of 826 agricultural professionals, including a subgroup of secondary agriculture teachers. Pierson (1993) found that secondary agriculture teachers ($\underline{n}$=86) placed a high degree of importance on agricultural safety and health and believed that teachers had an impact on reducing safety and health injuries for students. Pierson also found that 86% of the agriculture teachers reported they "shared agricultural safety and health information with others," and perceived themselves as being knowledgeable about health and safety hazards. However, the agriculture teachers achieved less than 50% when assessed on their knowledge of agricultural safety practices. With such a low assessment score, it would be difficult to presume that the teachers' teaching plans and instructional materials on agricultural safety were current and technically correct. As a result of reviewing Pierson's study, the TASK staff questioned if secondary agriculture teachers should be sharing safety information without inservice education and updated materials on agricultural safety and health.

The conclusion drawn by the TASK staff was not necessarily new. In 1968, Erisman identified a "critical need" for teacher preparation programs to include agricultural safety curriculum. Pierson and Murphy (1994) recommended that course work on agricultural safety be added to teacher preparation programs. Pierson and Murphy (1994) also stated that if "relevant instructional programs" were delivered to professionals, there was a likelihood that the educational materials would be reused to teach others about safety. A majority (86%) of secondary agriculture teachers in Missouri reported they would share agricultural safety and health information with students "if they had access to current information," and 75% of the teachers reported they would share information with students if they were comfortable with their knowledge of the subject matter (Missouri Teaching Agricultural Safety to Kids, 1996). Consequently, the TASK staff concluded that a needs assessment was needed to determine what topic-specific courses and instructional materials were desired by secondary agriculture teachers.

Purpose/Objectives

The purpose of the study was to assess secondary agriculture teachers' need for instructional materials and course work regarding agricultural safety. Based on a review of the literature and interviews with secondary agriculture teachers, the study targeted the following research questions:

1. Did secondary agriculture teachers perceive themselves to be competent in teaching agricultural safety?
2. Were secondary agriculture teachers interested in pursuing course work (inservice education) on agricultural safety and health?
3. Were secondary agriculture teachers in need of instructional and/or resource materials to effectively teach agricultural safety?

Methods/Procedures

Population and Sample

The target population was secondary agriculture teachers in the state of Missouri (N=320). The accessible sample consisted of teachers who attended a statewide professional development meeting during the annual vocational teacher conference (n=260).

Instrumentation

A questionnaire with 37 forced-choice and one open-ended question was developed to address the targeted research questions. The questionnaire consisted of two sections. The first section included demographic items and a matrix of eighteen agricultural safety topics. Teachers were asked to rank their interest in agricultural safety course work (inservice education) and in obtaining updated instructional materials for each of the eighteen topic areas. The agricultural safety topics were selected by cross-referencing state competency profiles for secondary agriculture courses with enrollment data obtained from Missouri's Department of Elementary and Secondary Education (1993). The second section of the questionnaire sought to assess barriers to, and motivation for, teacher participation in agricultural safety course work, and the need for specific types of educational materials.

A three-step review process was used to establish the content validity of the questionnaire. First, staff from the University's Assessment Resource Center (ARC) reviewed the instrument and helped assure that the survey questions and instructions were clear. Next, the instrument was reviewed by five agricultural safety professionals for technical accuracy. The final step consisted of field testing the instrument with ten preservice agriculture teachers.

Data Collection

The data were collected in July 1995 from teachers attending a statewide professional development meeting. The questionnaires were scrutinized for stray pencil marks and to assure that teachers completed the questionnaire correctly.

Results /Findings

Usable questionnaires were collected from 260 secondary agriculture teachers. The teachers were 94% male and 64% were less than 40 years of age. A majority (52%) of the respondents held a Master's degree. Approximately 86% of the agriculture teachers reported that they were also engaged in some level of production agriculture, with 50% stating they were "farm operators," and 36% reporting that they "regularly" or "occasionally" worked on a farm for others. Three-fourths of the teachers reported they had sustained an agricultural-related injury, with 24% of those seeking treatment in an emergency room and nine percent requiring hospitalization.

With regard to perceived competence in teaching agricultural safety, 83% of the teachers agreed with the statement, "I feel very competent to teach the important aspects of agricultural safety and health." A cross-tabulation by age showed that 90% of the teachers under 29 years of age strongly concurred with the statement. Other cross-tabulations showed that 73% of the agriculture teachers reported an agricultural-related injury, but these teachers did not report they were more or less competent to teach safety than those teachers who had never been injured. However, teachers who rarely participated in production agriculture activities reported they were less competent to teach agricultural safety than their peers who engaged in some level of farming activity (Table 1).

Table 1
Teachers' Perception of Competence to Teach Safety by Level of Farming Activity (n=252)

	Disagreed or strongly disagreed with statement	Agreed or strongly agreed with statement
Farm operator (n=128)	19%	81%
Regularly farms for others (n=29)	10%	90%
Occasionally farms for others (n=63)	13%	87%
Rarely participates in farming (n=32)	25%	75%

Note. Teachers' response to the statement, "I feel very competent to teach the important aspects of agricultural safety and health."

Approximately 95% of the teachers agreed that "staying current with agricultural safety and health" was crucial to their responsibilities as teachers, but only 19% of the teachers reported prior enrollment in college course work in agricultural safety. A majority of the teachers indicated they were "*not interested*" in course work for seven of the 18 topics (Figure 1). However, when asked to respond to the negatively-worded question, "I am not interested in safety and health course work at this time," 75% of the respondents disagreed or strongly disagreed with the statement.

Eighty nine percent of the teachers agreed or strongly agreed that "tuition reimbursement" was an important factor when pursuing course work on agricultural safety and health. Sixty seven percent of the teachers indicated they did not pursue course work because classes were not within a convenient distance. A majority of the teachers (58%) indicated a preference for a one-to-three-day workshop and 56% indicated they would prefer to attend a workshop at a secondary school.

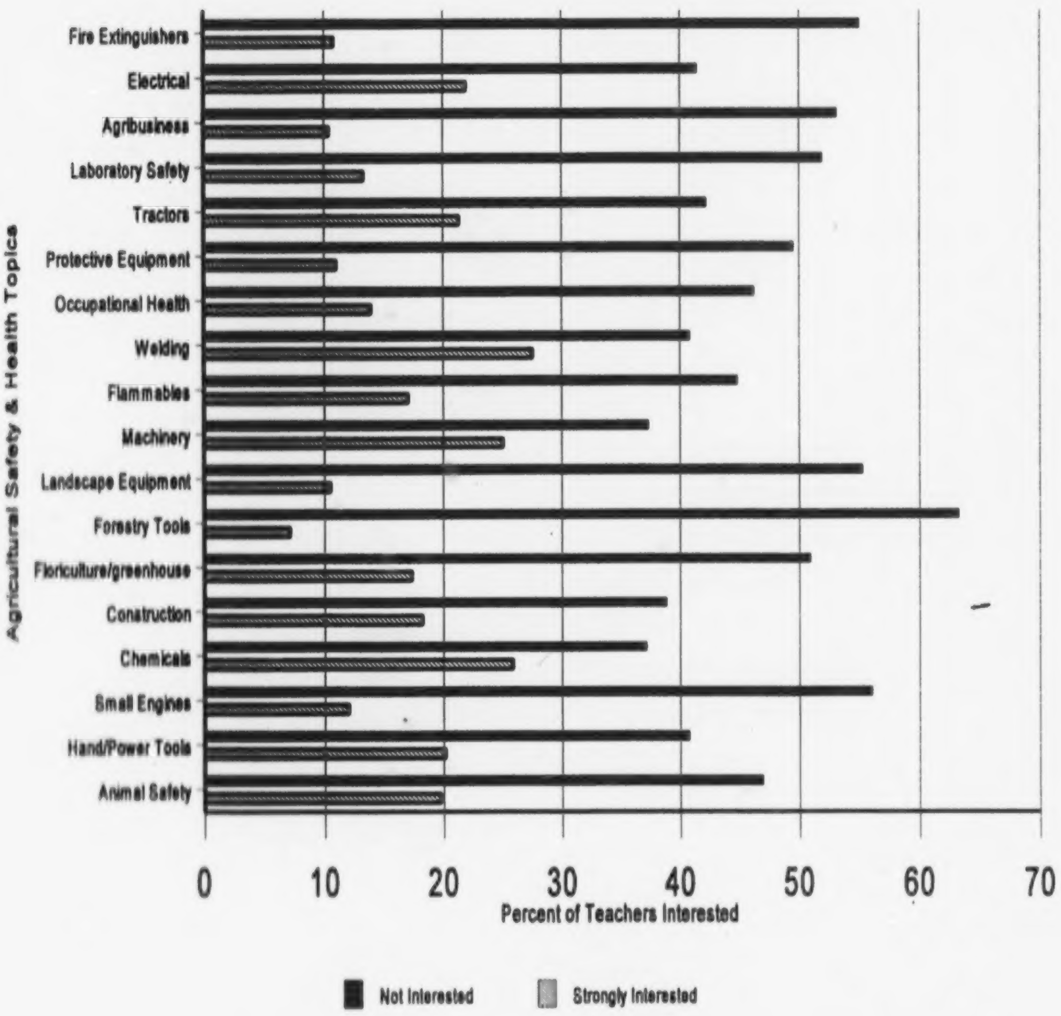

Figure 1. Secondary Agriculture Teachers Interest in Course Work (Inservice Education) Related to Agricultural Safety and Health.

In contrast to the teachers' lack of interest in topic-specific course work was the strong interest shown by teachers regarding the need for instructional materials on specific topics (Figure 2). On eight of the 18 topics, 40% or more of the teachers indicated they were "strongly interested" in receiving instructional materials. The safety topics included welding, machinery, tractors, chemicals and pesticides, hand and power tools, animals, electricity, and construction. The topic area of least interest to the teachers was forestry tools, with more than forty percent of teachers "not interested" in instructional materials.

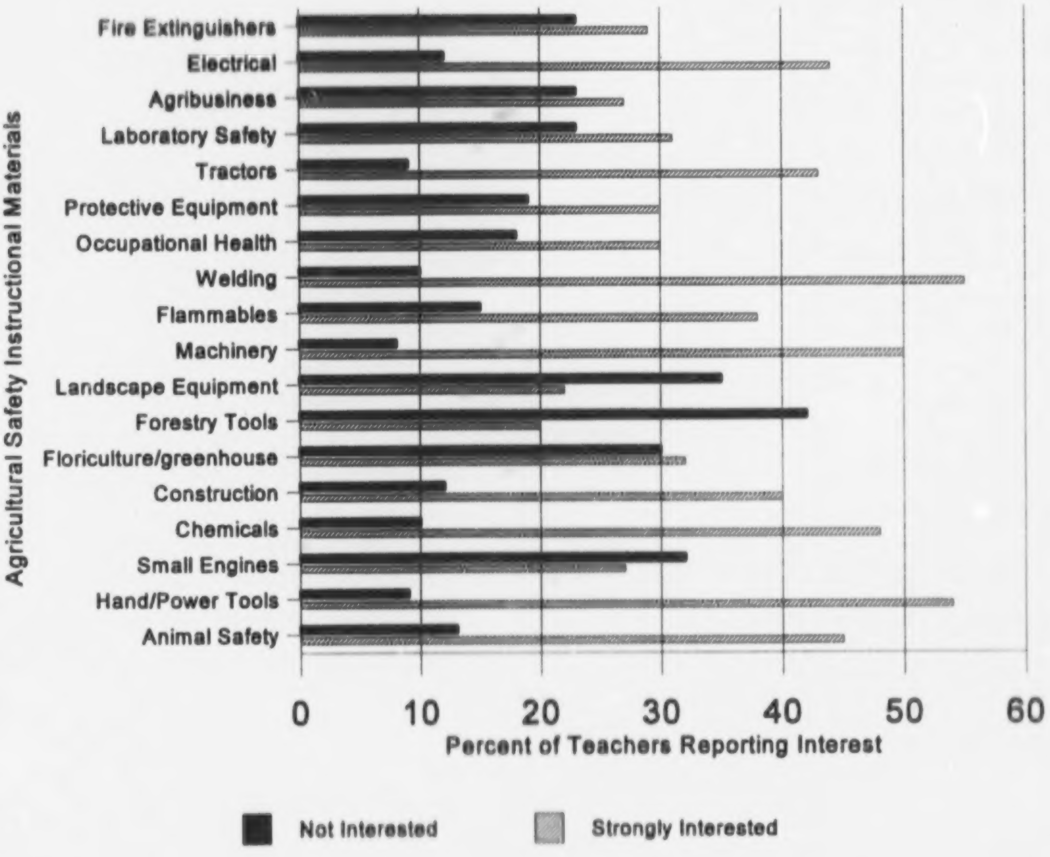

Figure 2. Secondary Agriculture Teachers' Interest in Updated Agricultural Safety Materials.

What types of instructional materials were needed by teachers to teach agricultural safety? The teachers indicated that videos were the preferred instructional tool for teaching safety, followed by fact sheets, textbooks, and computer software (Table 2). Less than one-fourth of the teachers indicated an interest in electronic information via the Internet.

Table 2
Types of Safety Instructional or Resource Materials Needed by Secondary Agriculture Teachers

	Frequency	Percent
Videos	224	86.1
Fact sheets	166	63.8
Textbooks	155	59.6
Computer software	137	52.6
Slides	92	35.3
Information on the Internet	55	21.1

Note. Teachers were permitted to select more than one response.

Conclusions/Recommendations/Implications

Similar to Pierson's (1993) research findings, the majority of agriculture teachers perceived themselves as competent to teach safety, but few reported formal course work or training in agricultural safety. Further, while a majority of the teachers agreed that "staying current with health and safety issues was critical" to their teaching responsibilities, few teachers reported a strong interest in enrolling in an agricultural safety course by topic area. However, 75% of the respondents disagreed or strongly disagreed with the statement "I am not interested in safety and health course work at this time."

The contradiction in responses (interested in course work versus not interested in topic-specific course work) may simply show that there are other safety and health topics of interest to the teachers that were not offered on the questionnaire. Another possibility is that the teachers would prefer an overview course that included numerous agricultural safety and health topics. The vast majority (89%) of the teachers indicated that "tuition reimbursement" was important to them. Therefore, teachers may also be selective about enrolling in topic-specific course work because it would be an out-of-pocket expense; a cost-versus-benefit decision. However, the question remains: If tuition was reimbursed, would they participate?

Sixty seven percent of the teachers indicated that commuting distance was a barrier to participation in course work, yet only 10% preferred the fairly accessible option of distance-delivery technologies. Interestingly, a majority of the teachers (58%) indicated a preference for a one-to-three-day workshop. This may indicate that the teachers do not have a problem with commuting, rather, the problem is commuting on a regular basis.

Teachers in the current study indicated a need for updated instructional materials on a vast array of agricultural safety subjects ranging from welding, to hand and power tools, to machinery and chemical safety. While inferences from the Missouri data cannot be made for teachers outside of the state, the findings from Erisman (1968), Pierson and Murphy (1994), and Bowling and Miller (1996) on agricultural safety education appeared to support the development of new agricultural safety instructional materials for secondary teachers.

The agriculture teachers in this study indicated a need for topic-specific agricultural safety instructional materials. Agricultural safety and health professionals, as well as teacher educators, should be responsive to those needs. However, before new resources can be developed, additional information should be sought from secondary agriculture teachers regarding (a) the specific safety competencies that should be taught, (b) the preferred format for new instructional materials, and (c) how best to integrate safety materials into existing agriculture curricula. To help identify these needs, an advisory committee should be established, primarily consisting of secondary agriculture teachers, to help guide the development of appropriate instructional materials.

Improving teacher competence on agricultural safety subjects is a perplexing issue. What support can be given to teachers to enable them to participate in lifelong learning opportunities and keep them abreast of changes in the field? It is doubtful that tuition reimbursement for secondary teachers will happen on a statewide basis, but a cooperative teaching agreement between University Extension, the Missouri Department of Elementary and Secondary Education, and the University of Missouri Agricultural Education program could help teachers defray inservice education costs.

University Extension's network of satellite teleconferencing centers could be used to teach course work to teachers in outlying areas of the state. The new technologies may soon make it possible for secondary teachers to down link programs directly at the school site, eliminating the time and costs of commuting. However, noting the low teacher interest in distance-delivery technologies, a pilot program should be offered.

Once an accessible, affordable system is identified, the teachers' interest in course work (inservice education) must be raised. Following Pierson's (1993) research model, teachers could be tested on their knowledge of agricultural safety, to determine what discrepancy, if any, exists between their perception of competency and their knowledge of agricultural safety and health. If that does not boost teacher interest in continuing education, another alternative is to illustrate to teachers, by use of case studies, how a lack of professional competency may be a negative factor influencing teacher liability.

While Pierson's (1993) study provided information on practicing teachers, further study is needed on the agricultural safety knowledge of preservice agriculture teachers. If it is found that preservice teachers have a satisfactory level of technical knowledge, then researchers must identify when it is that practicing teachers "forget" what was learned in college about agricultural safety.

There are numerous compelling reasons - moral and economic - that justify the need for adolescent agricultural safety education. Secondary agriculture teachers must be kept abreast of the changing technology and related safety issues. However, if secondary agriculture teachers remain disinterested in agricultural safety course work, then safety professionals and teacher educators must consider innovative methods to introduce new instructional materials to teachers, to help assure that teachers convey technically-accurate information to their students.

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An Assessment Of Agriculture Teachers' Needs Regarding Safety Instruction

A Critique

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There is no more important instructional area than safety. Assessing agriculture teachers' needs related to this subject makes for a very worthwhile study. The introduction raises a very important concern about whether agriculture teachers are qualified to teach safety. Do they possess accurate knowledge of safety practices? Overall, the researchers used appropriate procedures to answer their research questions. The instrumentation was enhanced by cross referencing safety topics with the state competency profiles. The researchers did a good job of describing the procedures used to establish validity of the instrument but did not report reliability. Results were presented clearly and enhanced with bar charts. It was reported that there was a strong interest in instructional materials, however on all but three topics, fewer than 50% of teachers reported a strong interest in updated safety materials. Regarding conclusions, I found no data to support the statement that only 10% preferred the fairly accessible option of distance delivery. I raise the following questions for clarification and/or discussion:

1. A study by Pierson (1993) was summarized in the introduction. In this study, 86% of teachers perceived themselves as knowledgeable about health and safety hazards, but teachers achieved less than 50% when assessed on their knowledge of agricultural safety practices. The first research question in this study dealt with teachers' perception of their competence in teaching agricultural safety. How important is this question in light of Pierson's study?

2. The researchers suggest following Pierson's research model to determine what discrepancy exists between teachers perceived competency and their knowledge of agricultural safety and health. What about the discrepancy between what they need to know (as indicated by experts) and what they actually know?

3. The authors write "if it is found that preservice teachers have a satisfactory level of technical knowledge, then researchers must identify when it is that practicing teachers 'forget' what was learned in college about agricultural safety." Is forgetting and when forgetting takes place the issue? Could it be that technologies change rendering previous education on safety obsolete?

Laboratory Safety Inservice Needs Of Texas Agricultural Science Teachers

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Introduction and Theoretical Framework

The neglect of safety practices in agricultural science laboratories across the country, especially agricultural mechanics laboratories, is well documented. A study that analyzed the safety practices of Louisiana vocational agriculture teachers demonstrates this neglect (Fletcher & Miller, 1995). The purposes of this study included: to determine the degree to which selected safety practices were used; and to determine the availability of safety equipment. Results provided the following information: three of 13 selected safety practices were used by 75% of the respondents, and four of 19 selected safety items were available in more than 75% of the laboratories. A similar study in North Dakota reflected this absence of safety items, when the researcher failed to find fire extinguishers in four of the schools surveyed (Swan, 1994).

Another study reflecting problems in safety practices was conducted in Ohio (Gliem & Miller, 1992b). This research also described safety practices used by teachers and safety equipment that was available. The population for the survey included all principals that had agricultural education programs in their schools. Results included: 46.1% of teachers required students to sign safety checklists; 57.1% of teachers allowed only one dangerous activity at a time; fewer than 50% of teachers provide safety material such as: color coded power tools, non-skid areas around power tools, and safety cabinets for explosives; and 12% laboratories did not contain a first aid kit.

Gliem, Miller and Hard took another look at Ohio laboratory safety (1993). This time the teachers were surveyed. The main question that was studied addressed the compliance of production agriculture programs with selected safety practices. Results reflect the previous studies' findings: no school was in full compliance with all selected safety practices, less than 5% of schools were in compliance with four of the 10 safety practices, and only one safety practice had a compliance of greater than 25%.

A study of agricultural mechanics safety practices of Texas agricultural science programs was also conducted (Lawver, 1992). Some of the purposes of this work were to determine: the degree to which selected safety practices were used, the availability of selected safety and emergency equipment, the perceived importance of agricultural mechanics safety topics, and the perceived ability of teachers to present the agricultural mechanics safety topics. The sample used for this study included a random sampling of all agricultural science teachers in Texas. The results of the other studies were also reflected in this study: 73% felt confident to administer first aid, 89.4% felt moderately well prepared to administer safety instruction, 16% of time use for agricultural mechanics instructions was spent in addressing safety, and 11.4% did not have first aid kits. In responding to the importance of selected safety topics, teachers rated all but one topic above the average level of three on a five-point rating scale. On the rating of a teacher's perceived ability to teach the safety topics, all but three of the 15 topics were above the average level of three on a five-point rating scale.

Miller conducted a study of the safety levels of vocational education laboratories in two Arizona counties (1991). One of the researcher's purposes in this study was to evaluate compliance levels of selected safety competencies. The random sample used contained 21 schools. The researcher completed the instrument on-site. Ten safety areas were evaluated and scored as to level of compliance. A panel of safety specialists ranked the importance of each of the ten topics. Results once again display an overall neglect of safety practices. For example: a large majority of schools failed to meet standards for means of egress, eight of the schools did not comply at all in the category of medical and first aid, four of the 21 school were in 100% compliance in the category of personal protective equipment, and no school was in total compliance with the ten safety categories.

Neglect is without excuse in light of the importance of laboratory safety (Lawver, 1992). Daniels (1980) stated, "perhaps the most important responsibility of any teacher in an agricultural mechanics setting is to ensure the safety of the students" (p. 4). In Miller's aforementioned study of Arizona vocational education laboratories he stated, "efforts in enforcement of safety standards is a current issue with nothing short of the safety of students enrolled being at stake" (1991, P.164). A study by Laird and Kahler (1995), found that agricultural science teachers ranked safety highest in instructional importance for the present and for the future. If this issue is of such importance, why is only a small portion of instructional time spent on safety, 10.1% (Baugher & Slocombe, 1990), 16% (Lawver, 1992), 17.2% (Johnson & Fletcher, 1990)? Also, Kigin (1963) stated that in the event of an accident in which a pupil is injured the teacher could face court charges. The importance of the topic versus the actions taken by teachers is contradictory.

Inservice Education

Administrators believe, "vocational teachers should periodically update their knowledge of current safety standards" (Gliem and Miller, 1992a, p. 146). Many researchers have concluded from their studies that inservice activities to address laboratory safety needs should be conducted. Studies conducted in Iowa, Ohio, Pennsylvania, Texas, and North Dakota have issued this call in such areas as state safety laws, planning and implementing comprehensive safety programs, Industrial Quality Eye Protection, operation of tools, and clean-up schedules (Bekkum & Hoerner, 1993; Gliem, Miller & Hard, 1993; Hilton & Bruening, 1993; Hoerner & Bekkum, 1989; Lawver, 1992; Swan, 1994). In light of the obvious need for inservice, more information must be collected on what areas of laboratory safety should be addressed in inservice education. Neason (1992) noted this need of collecting information and concluded that areas to be addressed could be found by assessing what teachers felt they needed to know. This would also create an opportunity for teachers to have input in inservice education. It has been found that many instructors said that they did not attend inservice programs because they felt that the topics were irrelevant (Gamon, Miller & Roe, 1994).

Borich Model

The Borich model was developed to assess the needs of educators in regard to inservice education (Borich, 1980). Barrick, Ladewig, and Hedges (1983) used this model and found that it provided "defensible data in identifying important topics in which teachers need further knowledge" (p. 19). One format of it uses a method that provides three columns. First, a list of competencies is provided that apply to "program activities and materials" (Borich, 1980, p. 39). Next, a column that allows for the teacher to numerically rate the "perceived relevance" of each listed competency (p. 40). Third, using the same type of rating scale, a column that includes the "perceived level of attainment" of each competency as perceived by the teacher is created (p. 40). Fourth, a discrepancy score is calculated between the "perceived relevance" and the "perceived level of attainment" (p. 40). Next, this is multiplied by the average importance and the resulting weighted discrepancy scores are divided by the number of observations to arrive at the Mean Weighted Discrepancy Scores (MWDS) (Garton & Chung, 1995). The final MWDS can then be ranked and be used to prioritize inservice needs of the population.

Purpose and Objectives

The purpose of this study was to identify inservice needs of agricultural science teachers pertaining to safety. Questions for a survey were created to answer four questions:

1. What safety subjects do agricultural science teachers perceive to be the most important?
2. What safety subjects do agricultural science teachers perceive they are capable of adequately teaching?
3. In what areas of safety do agricultural science teachers require inservice education?

Methods and Procedures

This was a descriptive study designed to assess inservice needs of agricultural science teachers in regard to safety. The study assessed the level of competency that each teacher had in a variety of competencies related to laboratory safety. In relation to those competencies, teachers rated their ability to comprehensively teach those competencies to their agricultural science students. An MWDS was calculated to identify the inservice needs of the teachers.

For this descriptive study, the population was all agricultural science instructors in Areas I, II, and IV. Texas is divided up into ten geographic areas. Areas I, II, and IV constitute the western regions of the state. These areas were chosen because, they represent the areas to which Texas Tech University Department of Agriculture Education and Communications most often provides inservice education.

The stratified sample was taken by randomly choosing one-half of the agricultural science teachers of each district in Areas I, II, and IV. This method was used to avoid double surveying of agricultural science teachers due to a concurrent survey being conducted.

The instrument for this descriptive study was a Dillman-type questionnaire. The format was a revised version of the Borich model that had been used to assess inservice needs of teachers (Borich, 1980). The model used a rating scale to determine ability and importance levels in the areas that are assessed.

Safety competencies to be surveyed were chosen based upon other safety studies from many states. Also, the curricula of agricultural mechanics, animal science, and plant science courses from Instructional Materials Service (IMS) were reviewed to complete the list of needed safety competencies (Instructional Materials Service, 1988a; Instructional Materials Service, 1988b).

Content validity and reliability were evaluated. The content validity of the instrument was verified by a panel of experts consisting of the faculty and staff of the Department of Agricultural Education and Communications at Texas Tech University. This panel revised the instrument as needed. Cronbach's coefficient alpha was used to check the reliability (a = .78).

The delivery of the survey was set-up as follows. First, the survey was mailed on April 5, 1996. The instruments were coded to assist in maintaining anonymity and for sorting by order of response. Included with the survey was a letter explaining the purpose of the project. Also, a self-addressed stamped envelope was included for added convenience in returning the survey. Next, a postcard was mailed on April 18, 1996 to non-respondents, as of that date, from the first mailing. Third, a second survey was mailed to non-respondents as identified by the code. The same instrument was mailed, and the cover letter was only slightly modified. This mailing occurred May 1, 1996. Finally, a follow-up of 10 percent of the non-respondents was conducted by a phone contact made by the researcher. Non-respondents were surveyed in regard to only demographic information.

Data analysis was conducted in five steps.

1. The ratings on the level of importance of each competency were compiled. A mean of each competency was calculated and a standard deviation was also established for each competency.
2. The ratings on the level of preparedness to teach the competency was compiled. A mean of each rating was calculated and a standard deviation was also established for each competency.
3. A mean weighted discrepancy score was established by using the following formula for each competency:
   Mean Weighted Discrepancy Score =
   (S(Importance - Ability) * Importance Mean).
   Number of Observations
4. The demographic information of the non-respondents was analyzed for any significant deviation from the demographic information of the respondents.

The steps of data analysis were all conducted using SPSS/PC+ for IBM computers. From these, the MWDS was calculated and reported in tabular form. The final step was calculated by deriving the means on a computer.

Findings

On April 5, 1996 the first round of surveys were mailed. Of the 163 mailed out, 50 (30.7%) were returned by April 20, 1996. April 20 was used as the cut-off date, because postcards were mailed April 18 and any returns after the 20th may have been the results of the postcard reminder.

As stated, the postcards were mailed April 18, 1996. Using returns from April 21 to May 4, there were 22 surveys returned. At this point, 44.2% were returned.

The second rounds of surveys were mailed out May 1, 1996. There were 45 surveys returned from May 5 to June 12. Also, during this time one survey returned indicated that a particular school no longer had an agricultural science program, therefore this school was removed from the sample size. This decreased the sample size to 162 with a total 117 (72.2%) returned.

The demographic information analyzed provided information about the teachers and their agricultural science programs. A total of 57% of the teachers held a bachelor's degree, while the remaining teachers held a master's degree. The mean number of years they have taught is 14.90. The mean age of the teachers was 40.50. Finally, the mean number of students enrolled in agricultural science courses was 73.60 and the mean number of students working in agricultural science laboratories was 43.66.

Non-respondents were surveyed in regard to their demographic information. There was no significant difference between respondents and non-respondents.

Those surveyed were asked to respond as to the importance of 51 safety competencies. On a five-point rating scale teachers marked the importance of each competency. The ratings for importance are indicated in Table 1.

Table 1: Ratings for Importance of Competencies

Number Rating	Importance
1	No
2	Below Average
3	Average
4	Above Average
5	Utmost

In reading the results of those surveyed, most safety competencies on the average were considered of at least "Average" importance. The one competency that fell below "Average" was "devices with self-contained air supply" with a mean of 2.95. Explaining the uses of and need for a welding helmet had the highest mean of all competencies with a 4.90 and the smallest standard deviation of .36. Following closely with this, two other competencies that pertain to eye safety are in the top five in importance of safety competencies. "Motivate students to be safe" was rated as the second most important of the listed safety competencies. Table 2 provides a complete list of the mean importance of each competency surveyed. One competency was omitted by more respondents than any other competency. On all competencies, except this one, the number of respondents ranged from 113 to 117. This competency received only 109 responses as to its importance and 110 responses in reference to ability to teach the topic. It pertained to the use of Material Safety Data Sheets (MSDS).

Table 2: Importance of Safety Competencies in Rank Order

Safety Competencies	M	SD
Explain use for and need of welding helmet	4.90	0.36
Motivate students to be safe	4.72	0.58
Explain proper use of power tools	4.62	0.52
Explain use for & need of welding goggles	4.58	0.84
Explain use for & need of chipping goggles	4.58	0.67
Administer safety exams	4.56	0.76
Teach electrical safety	4.53	0.70
Electrically ground power tools	4.48	0.73
Adjust power tools	4.45	0.64
Explain proper use of hand tools	4.44	0.65
Explain use for & need of safety spectacles with side shields	4.42	0.70
Change blades and belts	4.42	0.67
Place fire extinguishers	4.42	0.79
Properly set-up grinding wheels	4.34	0.79
Explain fire emergency procedures	4.33	0.82
Repair tools	4.32	0.75
Use protective measures for gears and moveable parts	4.31	0.78
Maintain fire extinguishers	4.31	0.90
Explain procedures in administering first aid	4.25	0.83
Explain use for & need of plastic face shields (clear or tinted)	4.23	0.89
Explain use for & need of chemical/splash goggles	4.21	0.81
Explain proper restraint & handling of livestock	4.18	0.78
Explain use for & need of welding curtain or screen	4.17	0.90
Choose basic first aid materials	4.16	0.83
Properly use ventilation systems	4.14	0.88

Table 2: Continued

Safety Competencies	M	SD
Properly dispose of oil	4.10	0.89
Cover sharp edges with guards	4.09	0.92
Create a clean-up schedule	4.05	0.89
Explain use for & need of dust goggles	4.05	0.85
Administer artificial respiration/CPR	4.03	0.97
Properly use spray paint respirator	3.98	0.98
Properly mark hazardous areas	3.94	1.00
Explain types and classes of fires	3.94	0.88
Explain use for & need of eyewash station procedures	3.94	1.06
Conduct laboratory safety inspections	3.88	0.89
Explain use for & need of OSHA standards for industrial safety glasses	3.85	1.01
Properly use mechanical filter respirator/dust mask	3.75	0.99
Complete accident report forms	3.70	1.02
Proper posting of safety posters	3.67	0.98
Use fire blankets	3.65	1.15
Explain use for & need of safety spectacles without side shields	3.59	1.19
Teach plumbing safety	3.59	0.89
Properly use dust/mist respirator	3.58	1.04
Properly use chemical cartridge respirator/gas mask	3.38	1.10
Color code shop	3.35	1.12
Use MSDS sheets	3.33	1.10
Properly use dust collection systems	3.30	1.07
Color code tools	3.24	1.15
Properly use devices with self-contained air supply	2.95	1.13

Note. 1 = "No"; 2 = "Below Average"; 3 = "Average"; 4 = "Above Average";
5 = "Utmost"

After teachers responded to the importance of each competency, they rated their ability to teach each of the 51 competencies. Once again, 5-point scale was used. Table 3 illustrates the level of each rating.

Table 3: Ratings for Ability to Teach Competencies

Number Rating	Ability to Teach
1	No
2	Below Average
3	Average
4	Above Average
5	Exceptional

Teachers' ratings of their ability to teach each competency had a smaller range of means than the importance of the competencies. The means ranged from 4.53 to 2.78. Teachers rated their strongest ability to teach in areas pertaining to eye protection. "Explain the use for & need of welding helmet" and "Explain the use for & need of welding goggles" ranked first and second respectively. The next two competencies directly pertained to teaching students how to use tools. These were "Explain proper use of power tools" and "Explain proper use of hand tool" respectively. Table 4 gives the results of the teachers' assessments of their abilities to teach each competency.

Table 4: Ability to Teach Safety Competencies in Rank Order

Safety Competencies	M	SD
Explain use for and need of welding helmet	4.53	0.64
Explain use for & need of welding goggles	4.30	0.80
Explain proper use of power tools	4.25	0.72
Explain proper use of hand tools	4.16	0.76
Explain proper restraint & handling of livestock	4.14	0.85
Explain use for & need of chipping goggles	4.12	0.81
Explain use for & need of safety spectacles with side shields	4.07	0.81
Motivate students to be safe	4.07	0.85
Change blades and belts	4.03	0.82
Explain use for & need of plastic face shields (clear or tinted)	3.97	0.84
Place fire extinguishers	3.97	0.91
Electrically ground power tools	3.97	0.86
Administer safety exams	3.94	0.73
Explain use for & need of welding curtain or screen	3.84	0.91
Explain use for & need of dust goggles	3.82	0.85
Use protective measures for gears and moveable parts	3.82	0.87
Adjust power tools	3.81	0.90
Choose basic first aid materials	3.80	0.88
Properly dispose of oil	3.78	0.96
Properly set-up grinding wheels	3.75	0.91
Repair tools	3.73	0.84
Explain use for & need of chemical/splash goggles	3.72	0.87
Maintain fire extinguishers	3.71	1.14
Explain fire emergency procedures	3.71	0.95
Cover sharp edges with guards	3.67	0.86
Teach electrical safety	3.66	0.89
Explain use for & need of safety spectacles without side shields	3.64	0.97
Create a clean-up schedule	3.62	1.00
Properly use ventilation systems	3.61	0.98
Proper posting of safety posters	3.48	0.97
Explain use for & need of OSHA standards for industrial safety glasses	3.47	1.02
Properly mark hazardous areas	3.47	0.99
Explain types/operation of fire extinguishers	3.43	0.93
Properly use spray paint respirator	3.41	1.07
Conduct laboratory safety inspections	3.39	0.86
Explain types and classes of fires	3.39	0.98
Explain use for & need of eyewash station procedures	3.35	1.16
Teach plumbing safety	3.32	0.91
Complete accident report forms	3.32	1.02
Explain proper handling of hazardous materials	3.24	0.90

Table 4: Continued

Safety Competencies	M	SD
Properly use mechanical filter respirator/dust mask	3.16	0.99
Use fire blankets	3.15	1.15
Administer artificial respiration/CPR	3.15	1.15
Color code shop	3.08	1.01
Properly use dust/mist respirator	3.07	1.07
Color code tools	3.03	1.02
Use MSDS sheets	2.95	1.05
Properly use chemical cartridge respirator/gas mask	2.78	1.07
Properly use dust collection systems	2.72	1.09
Properly use devices with self-contained air supply	2.45	1.09

Note. 1 = "No"; 2 = "Below Average"; 3 = "Average";
4 = "Above Average"; 5 = "Exceptional"

A Mean Weighted Discrepancy Score (MWDS) was calculated to determine the inservice needs of Texas agricultural science teachers in regard to laboratory safety. The MWDS revealed that the area of teaching electrical safety is the highest priority for inservice education. Also, two of the top four competencies pertained to the area of basic first aid. These competencies were "Administer artificial respiration/CPR" and "Explain procedures in administering first aid." Table 5 provides a complete list of MWDS scores for the safety competencies.

Table 5: Mean Weighted Discrepancy Scores in Rank Order

Safety Competencies	MWDS
Teach electrical safety	3.95
Explain proper handling of hazardous materials	3.67
Administer artificial respiration/CPR	3.58
Explain procedures in administering first aid	3.51
Motivate students to be safe	3.07
Adjust power tools	2.85
Explain types/operation of fire extinguishers	2.83
Administer safety exams	2.81
Explain fire emergency procedures	2.65
Maintain fire extinguishers	2.56
Properly set-up grinding wheels	2.56
Repair tools	2.55
Explain use for & need of eyewash station procedures	2.32
Properly use spray paint respirator	2.28
Electrically ground power tools	2.28
Properly use mechanical filter respirator/dust mask	2.21
Properly use ventilation systems	2.19
Explain types and classes of fires	2.11
Use protective measures for gears and moveable parts	2.10
Explain use for & need of chipping goggles	2.07
Properly use chemical cartridge respirator/gas mask	2.00
Explain use for & need of chemical/splash goggles	1.97

Table 5: Continued

Safety Competencies	MWDS
Place fire extinguishers	1.96
Properly use dust collection systems	1.91
Conduct laboratory safety inspections	1.89
Properly use dust/mist respirator	1.87
Properly mark hazardous areas	1.85
Use fire blankets	1.84
Create a clean-up schedule	1.77
Explain use for and need of welding helmet	1.75
Cover sharp edges with guards	1.71
Change blades and belts	1.70
Explain proper use of power tools	1.70
Explain use for & need of safety spectacles with side shields	1.58
Choose basic first aid materials	1.49
Properly use devices with self-contained air supply	1.48
Complete accident report forms	1.43
Explain use for & need of OSHA standards for industrial safety glasses	1.43
Explain use for & need of welding curtain or screen	1.38
Properly dispose of oil	1.33
Explain use for & need of welding goggles	1.27
Explain proper use of hand tools	1.25
Use MSDS sheets	1.22
Explain use for & need of plastic face shields (clear or tinted)	1.12
Teach plumbing safety	0.98
Explain use for & need of dust goggles	0.91
Color code shop	0.90
Color code tools	0.66
Proper posting of safety posters	0.66
Explain proper restraint & handling of livestock	0.18
Explain use for & need of safety spectacles without side shields	-0.12

Conclusions and Recommendations

Conclusions

Based upon the research, the following conclusions were made.

1. Agricultural science teachers in Areas I, II, and IV believe eye protection to be among the most important safety competencies. Three of the top five competencies indicated were "Explain use for and need of welding helmet," "Explain use for & need of chipping goggles," and "Explain use for & need of welding goggles." Respondents rated their ability to teach these competencies as "Above Average."
2. The seven safety competencies that teachers rated themselves as having the least ability to teach were also rated as the lowest in importance by teachers. These competencies were "Color code shop," "Properly use dust/mist respirator," "Color code tools," "Use MSDS sheets," "Properly use chemical cartridge respirator/gas mask," "Properly use dust collection systems," and "Properly use devices with self-contained air supply."
3. "Administer artificial respiration/CPR" and "Explain procedures in administering first aid" are high on the MWDS score list. They are listed in the top four. This is an indicator that Texas agricultural science teachers require inservice in the area of basic first aid.
4. Agricultural science teachers are not familiar with Material Safety Data Sheets (MSDS). This is reflected by the low response rate of 109 respondents in importance and 110 respondents in ability to teach.

5. Agricultural science teachers rated their ability to teach safety competencies highest in "Explain use for and need of welding helmet," "Explain use for & need of welding goggles," "Explain proper use of power tools," "Explain proper use of hand tools," and "Explain proper restraint and handling of livestock."
6. The following competencies were identified as having the highest need for inservice education, "Teach electrical safety," Explain proper handling of hazardous materials," "Administer artificial respiration/CPR," "Explain procedures in administering first aid, and "Motivate students to be safe."
7. The methods of inservice delivery were ranked, respectively, "Workshop," "Video Tape," "Community College Class," "Graduate Course," and "Distance Education."

Recommendations

1. A strong belief in the importance of eye protection has been instilled in the teachers. In light of its importance, this should continue to be reinforced by teacher educators and through teacher inservice methods.
2. Competencies pertaining to tool usage and safety ranked high in importance to agricultural science teachers.
3. The seven lowest rated safety competencies, in regard to ability to teach and importance, should be evaluated as to their importance in the agricultural science laboratory by teacher educators. Recommendations should be made as to whether these competencies should be either reinforced or ignored, depending upon findings. If these competencies are found to be important, teachers should be further educated in these areas.
4. First aid should be stressed through inservice education and possibly preservice education. In the Agricultural Education and Communications Department at Texas Tech University, the preservice aspect of this recommendation has already been met. Student teachers are required to receive CPR and First Aid certification before they begin their student teaching experience.
5. MSDS should be defined and stressed in general safety inservice education. The obvious omission in responding to this competency reflects a lack of knowledge about this topic. Also, reflecting this is the discrepancy that MSDS relates directly to "Explain proper handling of hazardous materials" and this was identified as a high priority inservice need.
6. Research should be conducted to determine if some of the areas such as "Teach electrical safety," "Explain proper handling of hazardous materials," and basic first aid could be more effectively taught in preservice education.
7. Based on the findings, inservice education should be conducted in the general areas of fire safety, personal protective equipment, repiratory devices, and power tool safety.
8. Further research should be conducted that addresses each safety area in a more detailed fashion. For example, a study should be conducted exclusively analyzing specific safety competencies in the area of horticulture.

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Laboratory Safety Inservice Needs Of Texas Agricultural Science Teachers

A Critique

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The authors provided a good summary of the research on laboratory safety in agriculture. The procedures were very thoroughly described and could easily be replicated. A random sample of ½ of the population was used to avoid double surveying the teachers. This was considerate of teachers and is important in maintaining good relationships. Safety competencies used in the instrument were identified from appropriate sources. Validity and reliability were addressed but it is unclear where the data used for determining reliability came from. The authors do a good job of reporting the results and the conclusions and recommendations were generally consistent with the results of the study. Overall this study was correctly done. I raise the following questions for clarification and/or discussion:

1. In the introduction the authors report results of other studies concerning time devoted to safety instruction. Findings of previous studies show that the proportion of instructional time devoted to safety ranged from 10.1% to 17.2%. The authors suggested that this was a small portion of instructional time. Do these figures account for the fact that safety instruction can be integrated throughout the instructional program? What is an acceptable amount?

2. The Borich Model used by the researchers is an accepted needs assessment model. Even so, I wonder how far we miss the mark in determining needs by using such an approach. In this model teachers are asked to indicate the "perceived relevance" of competencies and their "perceived level of attainment." Agriculture teachers are not safety experts. Therefore, what concerns me most about the model is the fact that we are asking them to rate the relevance of specific safety competencies. What if their perceptions are wrong?

3. It was recommended that inservice education be conducted in the general areas of fire safety, personal protective equipment, respiratory devices, and power tool safety. Should inservice be organized in this manner or could a general inservice on safety designed to address the priority competencies work? How likely is it that teachers who need the inservice will participate?

Preservice And Inservice Agricultural Mechanization/ Engineering Needs For First Year Agricultural Science Teachers In Texas

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Introduction/Theoretical Framework

As the agricultural industry grows and becomes more broad based, teacher educators in agricultural education are faced with the challenge of deciding what topic areas are important and how much of them should be taught in order to better prepare those entering the industry (Slocombe, 1984). Teacher educators must decide what courses and subject areas will give future agriculture science teachers the proper competencies in order that they may adequately instruct agriculture science students on the secondary level. This is important because the quantity and quality of each subject taught to agriculture education undergraduates tends to be positively correlated to their competency/ability to effectively teach those subjects as an agriculture science teacher (Howard, 1982). Jacobs (1972) stated, "A successful product (student) is usually equated with a relevant program and an instructor who has superior competencies to teach and direct the program" (p. 2).

"The primary objective of agricultural mechanics education is the development of the abilities necessary to perform the mechanical abilities to be done in agriculture" (Phipps, 1982, p. 2). Without the proper training in agricultural mechanization/engineering as an undergraduate, how can the agriculture sciences educator convey these skills, abilities, and scientific applications to their students? Bowen (1986) stated, "No matter what alternatives are put into place, vocational agriculture teachers must be masterful in directing the learning process yet technically competent" (p.3). Phipps and Reynolds (1992) also state that workers in agriculture required to have a college degree must have a back ground of knowledge and skills in agriculture and agricultural mechanics.

The area of agricultural mechanization/engineering has long been a very important part of the agriculture industry and agricultural education. The fact that at one time the basic curriculum guide for production agriculture in Texas suggested that one quarter of the school year be devoted to teaching agricultural mechanics, and the area of agricultural mechanics receive a substantially larger percentage of funds than any other area, both imply a significant amount of importance (Baker, 1977). With the ever increasing amount of mechanization in the agriculture industry, one would assume that it would be very important to be familiar with the skills, abilities, and scientific applications which are required in the area of agricultural mechanics (Phipps and Reynolds, 1992). Laird and Kahler (1995) concluded that agricultural mechanization/engineering is important and should continue to be a part of secondary agriculture programs. Harrison, Schumacher, and Birkenholz (1993) stated that college course requirements in agricultural mechanization/engineering are declining for agricultural education undergraduates even though the agricultural mechanization/engineering sector of the agricultural industry is growing. Harper, Buriak, and Hilton's (1995) findings indicate that agricultural mechanization/engineering is a very important part of secondary agriculture programs. Osborne (1992) states, "When compared to other segments of the curriculum, agricultural mechanics may hold the greatest potential for addressing a blend of literacy, vocational, applied science, and basic study objectives" (p. 4). Finally, Slocombe (1984) stated, "Because of the rapid advancements in agricultural mechanics and parallel developments in other fields there is a growing need for better education for those entering today's agriculture industry" (p. 22).

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Numerous studies pertaining to required agricultural mechanization/engineering competencies and the importance of effective agricultural mechanization/engineering education have been conducted in the past across the United States. All of these studies tend to agree with one another when defining who should accept responsibility of delivering the appropriate agricultural mechanization/engineering skills, abilities, and scientific knowledge to agriculture science teachers. Each study singled out the agricultural science teacher's undergraduate university as the primary institution responsible for insuring that the proper scientific applications, skills, and abilities have been taught (Baker, 1977; Heimgartner and Foster, 1981; Jacobs, 1972; Johnson, Schumacher, and Stewart, 1990; Schumacher and Johnson, 1988; and Weston, 1969).

If it is true that the necessary skills, abilities, and scientific applications be taught at the preservice/university level, how many hours of agricultural mechanization/engineering courses should be required? Weston (1969) stated, "I assume that fifteen semester hours of credit in agricultural engineering is more or less typical of most graduates in agricultural education. How educated persons can continue to think that teachers are qualified in agricultural mechanics with this type of undergraduate training is incomprehensible to me" (p. 171). If this was the opinion of an agriculture educator in 1969 when fifteen hours of course work was universal, but insufficient , for an agricultural education degree, what would the general consensus of those past educators be today? Weston (1969) went on to say, "The lack of adequate training of teachers, (in the area of agricultural mechanization/engineering), must surely some day catch up and destroy our image" (p. 171). "Teacher education programs should be designed to enable present and prospective teachers the skills they will be required to teach" (Knotts and Webb, 1974, p. 237).

Purpose/Objectives

The purpose of this study was to identify the instructional needs of first year agriculture science teachers, in the area of agricultural mechanization/engineering, for the State of Texas. Beginning agriculture science teachers with 0 - 4 years of experience were surveyed in order to determine if the population possessed any skill, ability, or scientific application deficiencies in the field of agricultural mechanics/engineering.

Objectives

1. Determine what agricultural mechanization/engineering skills, abilities, and scientific knowledge first year agricultural science teachers in Texas possess and if they are deficient in any areas;
2. Determine what agricultural mechanization/engineering skills, abilities, and scientific knowledges are possessed by agricultural science teachers in Texas with one to four years experience and if they are deficient in any areas;
3. Determine what agricultural mechanization/engineering college courses were taken by agricultural science teachers with zero to four years of experience, and if they are comfortable teaching the subject matter that they were taught; and
4. Describe opinions of agricultural science teachers in regard to selected topics concerning agricultural mechanization/engineering.

Methods/Procedures

Design

The design for the study was descriptive/ex-post facto. Beginning agriculture science teachers in Texas with 0 - 4 years of experience were surveyed in order to determine if they possessed any skill, ability, or scientific application deficiencies in the specified area of agricultural mechanization/engineering. In addition to demographic and opinion information, data were collected pertaining to agricultural science teachers' perceived competence and felt importance of various agricultural mechanization/engineering skills, abilities, and scientific application knowledge.

Population and Sample

The population of the study consisted of all agricultural science teachers in Texas with 0 - 4 years experience (N = 397). This population was chosen in order to find the curriculum needs for agricultural science teachers while they are teaching, and also to find any deficiencies which may stem from the preservice experience. A random sample, (n = 272), was taken using the SPSS/PC+ package for IBM computers to select the participants of the study from the population, and was derived from a table developed by Krejcie and Morgan (1970). A list of agricultural science teachers in Texas with 0 - 4 years experience was obtained through the Vocational Agricultural Teachers Association of Texas, (VATAT), and served as the population for the study. The obtained list supplied approximately 98% of the agricultural science teachers in Texas with 0 - 4 years of experience.

Instrumentation

The sample was surveyed using a one part, mailed questionnaire with questions developed using the Basic Curriculums for Semester Courses in Agricultural Sciences and Technology manual for the State of Texas. The questionnaire was based on the Borich-model (1980), in which the participants were given a skill, ability, or scientific knowledge area pertaining to a particular segment of agricultural mechanization/engineering, and then were asked to rate their perceived importance of the area and how they rate that area according to their skill, ability, and/or scientific knowledge level (teaching ability). Garton and Chung (1996) concluded that the Borich-model is an acceptable approach to determining inservice needs of beginning teachers. The participants responded to the given skill, ability, or scientific knowledge areas using a five-point, Likert-type scale for perceived importance and perceived skill, ability, and/or scientific knowledge level. The five points of the Likert-type scale were; "Utmost Importance," "Above Average Importance," "Average Importance," "Below Average Importance," and "No Importance," for the perceived importance of selected areas, and "Exceptional Ability," "Above Average Ability," "Average Ability," "Below Average Ability," and "No Ability," for perceived skill, ability, and/or scientific knowledge level. Participants were also asked questions in reference to their background and questions which would ask them to respond to statements. With regard to the statement questions, the participants were asked if they "Strongly Agreed," "Agreed," "Disagreed," or "Strongly Disagreed" to statements regarding their enjoyment of teaching agricultural mechanics/engineering, how adequate they felt the level of education they received at the preservice level in agricultural mechanics/engineering was, and how important they feel agricultural mechanics/engineering to be to the Texas agricultural sciences curriculum.

The content validity of the instrument was reviewed by a panel of experts from the Department of Agricultural Education and Communications at Texas Tech University.

The instrument was also pilot tested before it was implemented. Pilot test participants consisted of the Spring 1997 student teaching block in the Department of Agricultural Education and Communications at Texas Tech University and three secondary agricultural science teachers with varied amounts of teaching experience. The reliability of the instrument was checked using Cronbach's alpha, the resulting alpha coefficient was (alpha = 0.97).

Data Collection

During the month of October 1996, the researcher contacted the nine universities in the State of Texas who certify agricultural science teachers, by telephone. This was done in order to obtain information related to the agricultural mechanization/engineering courses offered and required by each of the universities. On January 31, 1997 the researcher administered the mailed survey to the sample population. A cover letter was included to explain the purpose of the study, also a self-addressed stamped envelope was enclosed with each coded questionnaire in order to increase the response rate. Reminder post cards were sent to all survey participants on February 5, 1997. A second round of instruments was sent to all participants who had not responded as of Tuesday, February 25, 1997 on Wednesday, February 26, 1997. A modified version of the first cover letter was included with the survey , along with a self-addressed, stamped return envelope. Reminder postcards were sent one week later on Wednesday, March 5, 1997. Finally, reminder phone calls were made beginning of Wednesday, March 12, 1997 through Tuesday, March 17, 1997. An overall response rate of 73.3% was established after reminder phone calls were made.

Analysis of Data

Responses from the participants were coded, tabulated, and analyzed using SPSS/PC+ for IBM computers. The majority of the data collected were descriptive data. These data were analyzed using means, standard deviations, and counts. Other data was analyzed using Mean Weighted Discrepancy Scores (MWDS) and included the contents of the following .

The ratings on the level of importance of each competency were compiled for first year teachers, teachers with one to four years of experience, and for all teachers surveyed. A mean and standard deviation was also established for each competency. The ratings on the level of ability to teach each competency was compiled for first year teachers, teachers with one to four years of experience, and for all teachers surveyed. A mean and standard deviation was also established for each competency.A mean weighted discrepancy score was established by using the following formula for each competency:

$$\text{Mean Weighted Discrepancy Score} = \frac{(\Sigma\ (\text{Importance} - \text{Ability}) \circ \text{Importance Mean}).}{\text{Number of Observations}}$$

The means of the rankings of each method of inservice delivery were calculated. The demographic information of the non-respondents was analyzed for any significant deviation from the demographic information of the respondents.

Results

Demographic Information

The sample of this study was predominately made up of teachers with 1-4 years of experience. The respondents (N = 195) consisted of 37 (18.9%) true first year teachers which had a mean age of 29.08 (SD = 8.75) years, 125 (64.1%) teachers with 1-4 years of experience which had a mean age of 30.5 (SD = 10.63) years, and the remaining 33 (16.9%) teachers were found to have more than five years of experience and were excluded from data analysis.

Objective One

The first objective was developed to examine the amount of importance, teaching ability and inservice needs held by first year teachers in the area of agricultural mechanization/engineering.

Table 1 illustrates the importance placed on agricultural mechanization/engineering units/topics by first year teachers. First year teachers placed the greatest amount of importance on those units/topics that dealt with safety. Other units/topics dealing with the basic identification, selection, and utilization of tools, equipment, and/or facilities were of great significance. First year teachers placed the least amount of importance on those units/topics that are included in the more advanced agriscience courses.

Table 1: Importance of Selected Units and Topics According to First Year Teachers

Agricultural Mechanization/Engineering Units/Topics	M	SD
Understanding and Applying Safe Working Practices That Apply to Agricultural Mechanics	4.81	0.74
Understanding and Applying Safe Working Practices That Apply to Metal Fabrication Technology	4.76	0.76
Understanding and Applying Safe Working Practices That Apply to Agricultural Power Technology	4.75	0.73
Understanding and Applying Safe Working Practices That Apply to Agricultural Structures Technology	4.73	0.77
Understanding and Applying Safe Work Practices That Apply to Home Maintenance and Improvement	4.73	0.73
Identifying, Selecting, and Using Hand Tools, Power Tools, and Measuring and Marking Devices	4.65	0.79
Selecting and Using Tools, Equipment and Materials	4.51	0.80
Planning, Establishing, and Maintaining Irrigation Systems	3.38	1.09
Recognizing Non-Traditional Structural Building Techniques	3.32	0.94

With respect to the level of teaching ability possessed by first year teachers in the area of agricultural mechanization/engineering, Table 2 illustrates that units/topics dealing with safety were considered to be those that first year teachers are the most experienced in. Other units/topics that first year teachers had high teaching ability in were topics dealing with the basic identification, selection, and utilization of tools, equipment, and/or facilities. Teachers felt they had the least amount of teaching ability in those units/topics that fall in the more advanced agriscience courses.

Table 2: Ability to Teach Selected Units and Topics According to First Year Teachers

Agricultural Mechanization/Engineering Units/Topics	M	SD
Understanding and Applying Safe Working Practices That Apply to Agricultural Mechanics	4.16	1.04
Understanding and Applying Safe Working Practices That Apply to Metal Fabrication Technology	4.14	0.95
Understanding and Applying Safe Working Practices That Apply to Agricultural Structures Technology	4.08	0.89
Understanding and Applying Safe Work Practices That Apply to Home Maintenance and Improvement	4.05	1.03
Understanding and Applying Safe Working Practices That Apply to Agricultural Power Technology	3.97	1.00
Identifying, Selecting, and Using Hand Tools, Power Tools, and Measuring and Marking Devices	3.97	0.96
Selecting and Using Tools, Equipment and Materials	3.89	0.88
Servicing and Maintaining a Home Heating and Cooling System	2.62	1.11
Selection and Maintenance of Hydraulic Motors	2.50	0.97

In regard to the MWDS in Table 3, it is revealed that units/topics belonging to the more advanced courses, such as Agriscience 323 (Agricultural Power Technology), 322 (Agricultural Metal Fabrication Technology), and 321 (Agricultural Structures Technology), have the greatest inservice needs. Also, the top seven units/topics are derived from either Agriscience 322 (Agricultural Metal Fabrication Technology) or Agriscience 323 (Agricultural Power Technology). Those units/topics which possess a smaller inservice need belong to the basic introductory Agriscience courses such as 102 (Applied Agricultural Science Technology), 221 (Introduction to Agricultural Mechanics), and 222 (Home Maintenance and Improvement).

Table 3: Mean Weighted Discrepancy Scores for First Year Teachers, in Rank Order

Agricultural Mechanization/Engineering Units/Topics	MWDS
Utilization of Tools, Equipment, and Facilities Related to Agricultural Power Technology	4.21
Performing Metal Technology Skills	4.11
Selection and Maintenance of Hydraulic Motors	4.01
Selecting, Operating, and Maintaining Agricultural Machines and Equipment	3.99
Planning for Cost-Effective Construction Techniques	3.88
Selecting and Maintaining Electric Motors	3.83
Understanding and Applying Safe Working Practices That Apply to Agricultural Power Technology	3.69
Performing Basic Plumbing Skills	1.03
Selecting and Using Surveying Equipment	0.92
Applying Basic Concrete Principles	0.60

Objective 2

The second objective was developed to examine the amount of importance, teaching ability, and inservice needs held by teachers with 1-4 years experience in the area of agricultural mechanization/engineering.

Table 4 illustrates the importance placed on agricultural mechanization/engineering units/topics by beginning teachers with 1-4 years of experience. Not unlike first year teachers, these teachers placed the greatest amount of importance on those units/topics that dealt with safety. Other units/topics dealing with the basic identification, selection, and utilization of tools, equipment, and/or facilities were of great significance. Teachers with 1-4 years of experience placed the least amount of importance on those units/topics that are included in the more advanced agriscience courses.

Table 4: Importance of Selected Units and Topics According to Beginning Teachers with 1-4 Years of Experience

Agricultural Mechanization/Engineering Units/Topics	M	SD
Understanding and Applying Safe Working Practices That Apply to Agricultural Mechanics	4.77	0.85
Understanding and Applying Safe Working Practices That Apply to Agricultural Metal Fabrication Technology	4.74	0.89
Understanding and Applying Safe Working Practices That Apply to Agricultural Power Technology	4.69	0.93
Understanding and Applying Safe Working Practices That Apply to Agricultural Structures Technology	4.68	0.91
Understanding and Applying Safe Working Practices That Apply to Home Maintenance and Improvement	4.66	0.92
Identifying, Selecting, and Using Hand Tools, Power Tools, and Measuring and Marking Devices	4.61	0.80
Selecting and Using Tools, Equipment, and Materials	4.44	0.80
Selection and Maintenance of Hydraulic Motors	3.54	1.14
Planning, Establishing, and Maintaining Irrigation Systems	3.47	1.04
Recognizing Non-Traditional Structural Building Techniques	3.34	1.05

Ability to teach units/topics in agricultural mechanization/engineering for teachers with 1-4 years of experience is given in Table 5. As with first year teachers, teachers with 1-4 years of experience felt that their greatest teaching ability was in the area of safety. Once again, those units/topics dealing with the basic selection, identification, and utilization of tools, equipment, and/or facilities ranked high in teaching ability. Teachers with 1-4 years of experience also possessed the least amount of teaching ability in the units/topics which fall in the more advanced agriscience courses.

Table 5: Teaching Ability of Selected Units and Topics According to Beginning Teachers with 1-4 Years of Experience

Agricultural Mechanization/Engineering Units/Topics	M	SD
Understanding and Applying Safe Working Practices That Apply to Agricultural Metal Fabrication	4.27	1.03
Understanding and Applying Safe Working Practices That Apply to Agricultural Mechanics	4.25	0.96
Understanding and Applying Safe Working Practices That Apply to Home Maintenance and Improvement	4.18	1.06
Understanding and Applying Safe Working Practices That Apply to Agricultural Structures Technology	4.17	1.06
Identifying, Selecting, and Using Hand Tools, Power Tools, and Measuring and Marking Devices	4.13	0.94
Understanding and Applying Safe Working Practices That Apply to Agricultural Power Technology	4.05	1.07
Selecting and Using Tools, Equipment, and Materials	4.00	0.94
Selecting and Maintaining Electric Motors	2.67	0.95
Selection and Maintenance of Hydraulic Motors	2.35	1.06

Regarding MWDS in Table 6, it is revealed that units/topics belonging to the more advanced courses, such as Agriscience 323 (Agricultural Power Technology), 322 (Agricultural Metal Fabrication Technology), and 321 (Agricultural Structures Technology), have the greatest inservice needs. Also, the top six units/topics are all derived from Agriscience 323 (Agricultural Power Technology). Those units/topics which possess a smaller inservice need belong to the basic introductory Agriscience courses such as 102 (Applied Agricultural Science Technology), 221 (Introduction to Agricultural Mechanics), and 222 (Home Maintenance and Improvement).

Table 6: Mean Weighted Discrepancy Scores for Beginning Teachers with 1-4 Years Experience in Rank Order

Agricultural Mechanization/Engineering Units/Topics	MWDS
Selection and Maintenance of Hydraulic Motors	4.20
Selecting and Maintaining Electric Motors	3.79
Selecting, Operating, and Maintaining Tractors	3.55
Utilization of Tools, Equipment, and Facilities Related to Agricultural Power Technology	3.52
Selecting, Operating, and Maintaining Small Air-Cooled Engines	3.27
Selecting, Operating, and Maintaining Agricultural Machines and Equipment	3.27
Selecting and Applying Paints and Preservatives	1.49
Performing and Applying Cold Metal Working Skills	1.19
Identifying Fencing Methods	0.00

Objective 3

The third objective was created in order to find what college courses in the area of agricultural mechanization/engineering are being taken by all of the teachers surveyed. This was done by asking teachers to indicate which courses they participated in during their collegiate experience. Next, teachers were asked to indicate, of the courses they participated in, which ones they felt comfortable teaching their content. The data in Table 7 indicate to the reader the 11 most common of 24 courses taken by the participating teachers and the percentage of teachers who felt comfortable with teaching the course content.
Table 7 indicates that the top four agricultural mechanization/engineering courses taken by agricultural science teachers with zero to four years of experience, while in college, were "Metal Fabrication and Welding," "Agricultural Buildings and Construction," "Agricultural Power Units (Small Gas Engines)," and "Agricultural Electrification." Also, the top five courses were taken by at least 50% of the teachers surveyed. Courses such as "Agricultural Buildings and Construction," "Agricultural Power Units," and "Agricultural Surveying" all have high percentages of teachers taking the course, but considerably lower percentages of teachers comfortable with teaching what they learned.

Table 7: College Courses Taken by Beginning Teachers with Zero to Four Years of Experience and Their Level of Comfort with Teaching The Course Content

Agricultural Mechanization/Engineering College Courses	% Taken	% Comf.
Metal Fabrication and Welding	82.1	70.4
Agricultural Buildings and Construction	68.5	41.4
Agricultural Power Units (Small Gas Engines)	61.7	32.7
Agricultural Electrification	51.2	36.4
Introduction to Agricultural Mechanics/Engineering	50.0	34.0
Methods of Teaching Agricultural Mechanics	37.0	9.9
Agricultural Surveying	35.8	11.7
Soil and Water Management	26.5	16.0
Agricultural Farm Machinery	22.8	11.1
Agricultural Drafting	16.0	8.0
Tractor Mechanics	15.4	9.9

Objective 4

Objective 4 was created in order to describe opinions' of beginning Texas agricultural science teachers according to selected topics concerning agricultural mechanization/ engineering.

Table 8 indicates teacher responses to the first of three statement questions, in which teachers were asked to respond to the statement, "I enjoy teaching Agricultural Mechanization/Engineering courses." Overall, 88.9% of beginning teachers with zero to four years of experience "Strongly Agreed" or "Agreed", indicating that the majority of participants enjoy teaching agricultural mechanization/engineering courses.

Table 8: Teachers Opinions Concerning Their Enjoyment of Teaching Agricultural Mechanization/Engineering Courses

Degree of Agreement	0 years	1-4 years	0-4 years
1. Strongly Agree	48.6%	50.4%	50.0%
2. Agree	37.8%	39.2%	38.9%
3. Disagree	13.5%	7.2%	8.6%
4. Strongly Disagree	0.0%	1.6%	1.2%
No Answer	0.0%	1.6%	1.2%

Table 9 indicates teacher responses to the second of three statement questions, in which teachers were asked to respond to the statement, "I received an adequate education in Agricultural Mechanization/Engineering during my collegiate experience." Only 56.7% of first year teachers "Strongly Agreed" or "Agreed" that they received an adequate education in agricultural mechanization/engineering. Overall, only 68.5% of teachers with zero to four years experience "Strongly Agreed" or "Agreed" that they received an adequate agricultural mechanization/engineering education.

Table 9: Teachers Opinions Concerning the Adequacy of Their College Education in Agricultural Mechanization/Engineering

Degree of Agreement	0 years	1-4 years	0-4 years
1. Strongly Agree	18.9%	17.6%	17.9%
2. Agree	37.8%	54.4%	50.6%
3. Disagree	35.1%	22.4%	25.3%
4. Strongly Disagree	5.4%	4.0%	4.3%
No Answer	2.7%	1.6%	1.9%

Table 10 indicates teacher responses to the third and final statement question, in which teachers were asked to respond to the statement, "I feel that Agricultural Mechanization and Engineering is an important part of the Texas Agriscience Curriculum." All (100%) agricultural science teachers surveyed either "Strongly Agreed" or "Agreed" that agricultural mechanization and engineering is an important part of the Texas agriscience curriculum. 69.9% of all teachers surveyed "Strongly Agree" that agricultural mechanization/engineering is an important part of the Texas agriscience curriculum. None of the teachers surveyed "Disagreed" or "Strongly Disagreed" to the statement that agricultural mechanization and engineering is an important part of the Texas agriscience curriculum.

Table 10: Teachers Opinions Concerning the Importance of Agricultural Mechanization and Engineering to the Texas Agriscience Curriculum

Degree of Agreement	0 years	1-4 years	0-4 years
1. Strongly Agree	62.2%	71.2%	69.1%
2. Agree	37.8%	28.8%	30.9%
3. Disagree	00.%	0.0%	0.0%
4. Strongly Disagree	00.%	0.0%	0.0%
No Answer	0.0%	0.0%	0.0%

Conclusions/Recommendations

Agricultural science teachers with 0-4 years of experience place the greatest importance on teaching safety principals in agricultural mechanization/engineering courses. Also, these teachers possess the greatest teaching ability in teaching safety principals, the basic identification and use of tools, equipment, and facilities, and the more basic units/topics which are primarily located in Agriscience courses 102 (Applied Agricultural Science Technology), 221 (Introduction to Agricultural Mechanics), and 222 (Home Maintenance and Improvement). Agricultural science teachers with 0-4 years of experience possess the greatest inservice needs in the more advanced courses such as Agriscience 321 (Agricultural Structures Technology), 322 (Agricultural Metal Fabrication Technology), and 323 (Agricultural Power Technology). Competencies in these courses scored the highest Mean Weighted Discrepancy Scores, thus their inservice needs were the greatest. First year teachers did possess a greater inservice need in the areas mentioned above than did teachers with one to four years of experience.

The four most common agricultural mechanization/engineering college courses taken by beginning agricultural science teachers with zero to four years of experience were: "Metal Fabrication and Welding," "Agricultural Buildings and Construction," "Agricultural Power Units (Small Gas Engines)," and "Agricultural Electrification". College courses such as "Agricultural Buildings and Construction," "Agricultural Power Units (Small Gas Engines)," and "Agricultural Surveying" all had over 50% of agricultural science teachers participating in the courses, but the agricultural science teacher's percentage of comfort teaching what they had learned in these courses were significantly lower. Also, many of the units/topics requiring higher inservice needs which were mentioned earlier are rooted in the college courses "Agricultural Buildings and Construction," and "Agricultural Power Units (Small Gas Engines)."

Beginning agricultural science teachers with zero to four years of experience enjoy teaching agricultural mechanization/engineering courses and believe that agricultural mechanization and engineering is an important part of the Texas agriscience curriculum.

Teacher educators should strive to better prepare first year teachers to teach the more advanced agricultural mechanization/engineering semester courses such as Agriscience 321 (Agricultural Structures Technology), 322 (Agricultural Metal Fabrication), and 323 (Agricultural Power Technology).

Inservice opportunities should be provided for beginning teachers in order that they may also be better equipped to teach agricultural mechanization/engineering semester courses such as Agriscience 321 (Agricultural Structures Technology), 322 (Agricultural metal Fabrication), and 323 (Agricultural Power Technology).

Departments of agricultural education, agricultural engineering, and agricultural mechanization in the nine universities in Texas who certify agricultural science teachers should investigate the quality of education that their undergraduates are receiving in agricultural mechanization/engineering courses. Changes should be made to improve the quality of agricultural mechanization/engineering courses which have expressed high inservice needs in the units/topics discussed in the research.

Considering the perceived importance of agricultural mechanization/engineering, the number of agricultural science teachers who enjoy teaching agricultural mechanization/engineering, and the number of agricultural science teachers who feel they did or did not receive an adequate education in agricultural mechanization/engineering during their collegiate experience, a movement should be made to increase the number of agricultural mechanization/engineering courses agricultural education undergraduates are required to participate in.

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Preservice And Inservice Agricultural Mechanization / Engineering Needs For First Year Agricultural Science Teachers In Texas

A Critique

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This is an important study. Identifying the needs of beginning teachers and meeting the needs through preservice and inservice education can help teachers be more successful. Enhancing the success of teachers may be a key in retention and is very important in this time of teacher shortages. The introduction set the stage for this study and the procedures used were appropriate for addressing the objectives. One of the strengths of the procedures was the use of the secondary curriculum in Agricultural Sciences and Technology as the source of statements for the instrument. In addition, an accepted needs assessment model was used to design the instrument. Some minor concerns about procedures include: the design of the study was incorrectly identified as ex post facto, Cronbach's alpha should have been reported for each scale, and a problem with frame error was encountered as 16.9% of the respondents did not fit the definition of beginning teachers. Importance, ability and MWDS data were only reported for selected units and topics. How many units and topics were included on the instrument? Readers of this paper should be reminded that the ability data represents what teachers think they are able to teach. I raise the following questions for clarification and/or discussion:

1. The researchers report that only 56.7% of the first year teachers agreed or strongly agreed that they had received an adequate education in agricultural mechanization/engineering. Would a similar result be found if you were asking about other agricultural subject matter? Aren't first year teachers normally concerned about their competence in subject matter?
2. One of the recommendations was that teacher educators strive to better prepare first year teachers. What sorts of things should they do in striving toward that end?
3. How do the inservice needs that were identified match up to the content of the undergraduate requirements in agricultural mechanization? The researchers say that information was collected from the nine universities that certify agricultural science teachers regarding their offerings and requirements related to agricultural mechanization/ engineering courses. This data was not reported.
4. Without addressing question three, how can the recommendation be made to increase the number of agricultural mechanization/ engineering courses agricultural education undergraduates are required to participate in? Should students be required to go beyond four years to complete their degree or should we drop other requirements in favor of these new agricultural mechanization requirements?

The Role of Agricultural Mechanization in the Secondary Agricultural Education Curriculum as Viewed by Agricultural Educators

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Introduction

In the past several years, many articles have been written and several studies undertaken, that address the need for change in agricultural mechanization education in secondary agricultural education programs (Eighmy, 1995; Shinn, 1995; Laird, 1994; Buriak, 1992; Osborne, 1992; Slocombe, 1986). One of the most prominent studies addressing changes in agricultural mechanization was a study undertaken by the National Research Council (NRC, 1988). The NRC established the Committee on Agricultural Education in Secondary Schools to assess the state of agricultural education in America.

The committee's findings indicated that much of the focus and content of today's vocational agriculture programs is out of date. Production agriculture still dominates many agricultural education programs, even though a smaller percentage of people are actually engaged in production agriculture. There are broader needs in agricultural education that reflect the changes in America's food and fiber industry that need to be met by refocusing the content of agricultural education programs (NRC, 1988).

Additionally, the council found that vocational agriculture programs are uneven in quality. Good programs need to be supported, built upon, and replicated. Programs not meeting educational needs should be upgraded, consolidated, or phased out. Applied learning should continue to be stressed, but instruction in science, technology, economics, agribusiness marketing and management, international agriculture and public policy should be strengthened (NRC, 1988). The council also was concerned about how teacher education programs in agricultural education were preparing their teachers.

The need for change in the agricultural mechanics education was emphasized by Buriak (1992). He stated that many agricultural educators view agricultural mechanics as a non-essential area, with the move to a more science-based curricula and less agricultural mechanics required for teacher certification.

According to Buriak (1992), a more science-based agriculture curriculum lends itself directly to science applications in agricultural mechanics. Physical science applications and mathematics are the foundation for instruction in agricultural mechanics (Buriak, 1992). The agricultural industry is increasingly technologically-based. As technology becomes more sophisticated, the links to science become stronger, and students need the opportunity to explore and understand the scientific basis of agricultural mechanics.

Agricultural mechanics provides the opportunity for students to experience applied physical sciences and mathematics within an agricultural context, emphasizing the principles, concepts and laws of science, and their mathematical relationships that support and explain agriculture (Buriak, 1992). Agricultural mechanics needs to be taught with these concepts in mind.

According to Osborne (1992), agricultural mechanics programs must do more than teach skill development and project construction. Agricultural mechanics must be taught as applied physical science with math concepts and principles. There must be a shift from a product focus to a process focus (Osborne, 1992). The focus must be on the "why" a practice or skill is performed.

Osborne (1992) also stated that the goals and objectives of agricultural mechanics need to be re-examined, and curriculum re-designed to help teachers accomplish the objectives of the program.

A study conducted by the Council for Agricultural Education, Agricultural Mechanics Task Force, examined curricular issues in the secondary school agricultural mechanics program area (Shinn, 1995). The strengths of the agricultural mechanics program were found to be that it emphasized active learning by doing, and that it developed positive self-esteem among students, especially under-achievers (Shinn, 1995).

More direction is needed in the field of agricultural mechanization for curriculum development, improvement, and delivery. Osborne (1992) stated:

> As we continue to improve the secondary curriculum, agricultural mechanics must be reexamined and reshaped along with other curriculum specializations. When compared to other segments of the curriculum, agricultural mechanics may hold the greatest potential for addressing a blend of literacy, vocational, applied science, and basic study objectives. (p. 4)

There is a need for change in the agricultural mechanics curriculum and the delivery of these programs in particular. As agriculture and technology continue their evolution, agricultural mechanization instruction must continually reflect that evolution. A continual process of rethinking, restructuring, and reshaping of agricultural mechanization education is needed.

Studies have been conducted to determine perceptions of teacher educators and administrators regarding the changes needed to be made, but there is a lack of input from the secondary school agricultural educators regarding their perceptions of agricultural mechanics as it now exists and the need for change.

Purpose and Objectives

The purpose of this study was to determine the perceptions of agricultural educators regarding the role of agricultural mechanization in the agricultural education curriculum in secondary schools throughout the central region of the United States. The study sought to draw implications to teacher education programs to provide direction for enrichment of the curriculum. Specific objectives were:

1. To identify perceptions held by secondary school agricultural teachers regarding selected concepts in agricultural mechanization education.
2. To design a practical curriculum model for development of agricultural mechanization in agricultural education programs.

Methods/Procedures

The population for this descriptive survey study was defined as all secondary agricultural education teachers in the twelve states within the central region of the United States. The twelve states included in this region were: Ohio, Illinois, Minnesota, Wisconsin, Missouri, Iowa, Indiana, Kansas, Nebraska, Michigan, North Dakota and South Dakota. The total population of secondary agricultural education programs was 2,465. It was determined that the necessary sample size was 335 teachers of agriculture (Krejcie & Morgan, 1970). Based upon the unequal population size among the states, a stratified, proportional random sample was developed to establish equal representation of the total population. The random number generator in SPSS/PC+ was utilized to determine sample selection by state.

An instrument was developed by the researchers to gather the data. The instrument was designed to determine specific perceptions of respondents regarding selected concepts of agricultural mechanization in the secondary agricultural education curriculum. Teachers responded to ten questions with a five point Likert-type scale used to indicate responses. The ten questions were derived from the work of Eighmy (1995). The instrument was submitted to a panel of experts consisting of Iowa State University faculty and graduate students knowledgeable in both Agricultural Education and Agricultural Mechanization to determine face and content validity.

The instrument was mailed to 20 selected secondary agricultural educators for pilot-testing. Instructors were asked to complete the questionnaire and provide input concerning the content of the instrument as well as comment about the length and understandability of the instrument. Responses and suggestions received were used to revise the instrument's format and content.

Data were collected in the Spring of 1996. Subjects were sent a package containing a cover letter, revised questionnaire, and a self-addressed, stamped envelope. The initial mailing was followed up with a postcard reminder, and later a follow-up letter and another questionnaire were mailed to all non-respondents. Cover letter content and format of all three mailings were devised from Dillman (1978).

The responses totalled 216, thus establishing the response rate of 65 percent. Phone interviews were conducted with ten percent of the nonrespondents by state, thus maintaining the proportional consistency. The total number of nonrespondents contacted was 16. All 16 were randomly selected within their respective states. Mean scores were compared by a t-test. There were no significant differences at the .05 level found, thus allowing the researchers to generalize the findings to the population. Descriptive statistics were used to analyze the data.

Results/Findings

Table 1 provides information regarding agricultural educators' perceptions of the role of agricultural mechanics in the Agricultural Education curriculum. Respondents were asked to indicate their level of agreement with ten statements about the role of agricultural mechanics in agricultural education.

Question number one was: "Most secondary school agricultural education instructors are under pressure to reduce the amount of time for agricultural mechanics instruction." It can be observed that 30.2% of respondents "Disagreed" or "Strongly Disagreed" with the statement. The percentage of instructors that "Agreed" or "Strongly Agreed" with the statement was nearly 50%.

"Stand-alone courses in agricultural mechanics are critical components of agricultural education programs" was the second question. Responses to this statement indicated that the majority (69%) "Agreed" or "Strongly Agreed." Those "Disagreeing" or "Strongly Disagreeing" numbered 24 (12%).

The next question, "Agricultural mechanics concepts and skills should be integrated into other agriculture courses in the program," elicited 73.1% "Agree" or "Strongly Agree" responses. "Disagree" accounted for 7.9% of responses, and no respondents "Strongly Disagreed" with the statement.

Almost 60% of respondents "Strongly Disagreed" or "Disagreed" with the statement: "There should be a reduced emphasis in agricultural mechanics instruction on subject content areas relating specifically to production agriculture." Only 20.8% "Agreed" or "Strongly Agreed" with the statement. This statement was negatively written; by indicating disagreement with the statement, respondents were indicating that there should not be a reduced emphasis in agricultural mechanics instruction on subject content areas relating specifically to production agriculture.

Question five read, "Courses in agricultural mechanics at the secondary level should primarily emphasize the development of employment skills." Respondents indicated "Agree" or "Strongly Agree" at 51.6%, while "Disagreeing" or "Strongly Disagreeing" at 24.6%. Neutral respondents accounted for 23.7% of the group.

"Instruction in agricultural mechanization should focus on developing general knowledge and skills that are transferable to a wide range of job clusters rather than specific knowledge and skills that focus on a specific job in a job cluster" was statement number six. A consensus was reached concerning this statement with 85.6% of respondents "Agreeing" or "Strongly Agreeing" with the issue. Those "Disagreeing" made up 5.6% of respondents, while no respondents "Strongly Disagreed" with the statement.

The next statement read, "High school students need an opportunity to design, build, and take home projects involving good craftsmanship to develop healthy self-concepts, self-esteem, and pride in quality workmanship." Consensus was again reached with 92.6% of respondents "Agreeing" or "Strongly Agreeing" with the statement. The mean for this group was 4.33 and the standard deviation was .68.

Respondents totaling 44.9% "Agreed" or "Strongly Agreed" with the statement: "Instruction in agricultural mechanics should be modeled around a systems concept that addresses basic systems found in complex machines such as fluid power systems, electrical systems, water systems, etc. rather than the traditional areas such as concrete and masonry, hot and cold metals, tractor mechanics, etc." Those "Disagreeing" or "Strongly Disagreeing" with the statement accounted for 27.8% of the respondents.

"Courses in agricultural mechanics at the secondary level should be science-based, applied physics with applications in agriculture" was the next statement. The total number of respondents "Agreeing" or "Strongly Agreeing" with the statement were 111 (47.4%), respondents "Disagreeing" or "Strongly Disagreeing" were 39 (18%). Instructors that were neutral on this question totaled nearly 31%.

The final statement, "Agricultural mechanics instruction in most high school agricultural education programs adequately addresses the educational needs of both college bound and non-college bound students" indicated 43.1% of respondents "Agreeing" or "Strongly Agreeing," while 26.9% "Disagreed" or "Strongly Disagreed."

The findings of the study guided the researchers in the development of a practical curriculum model for agricultural mechanization in agricultural education programs. The model, Curriculum Model for Agricultural

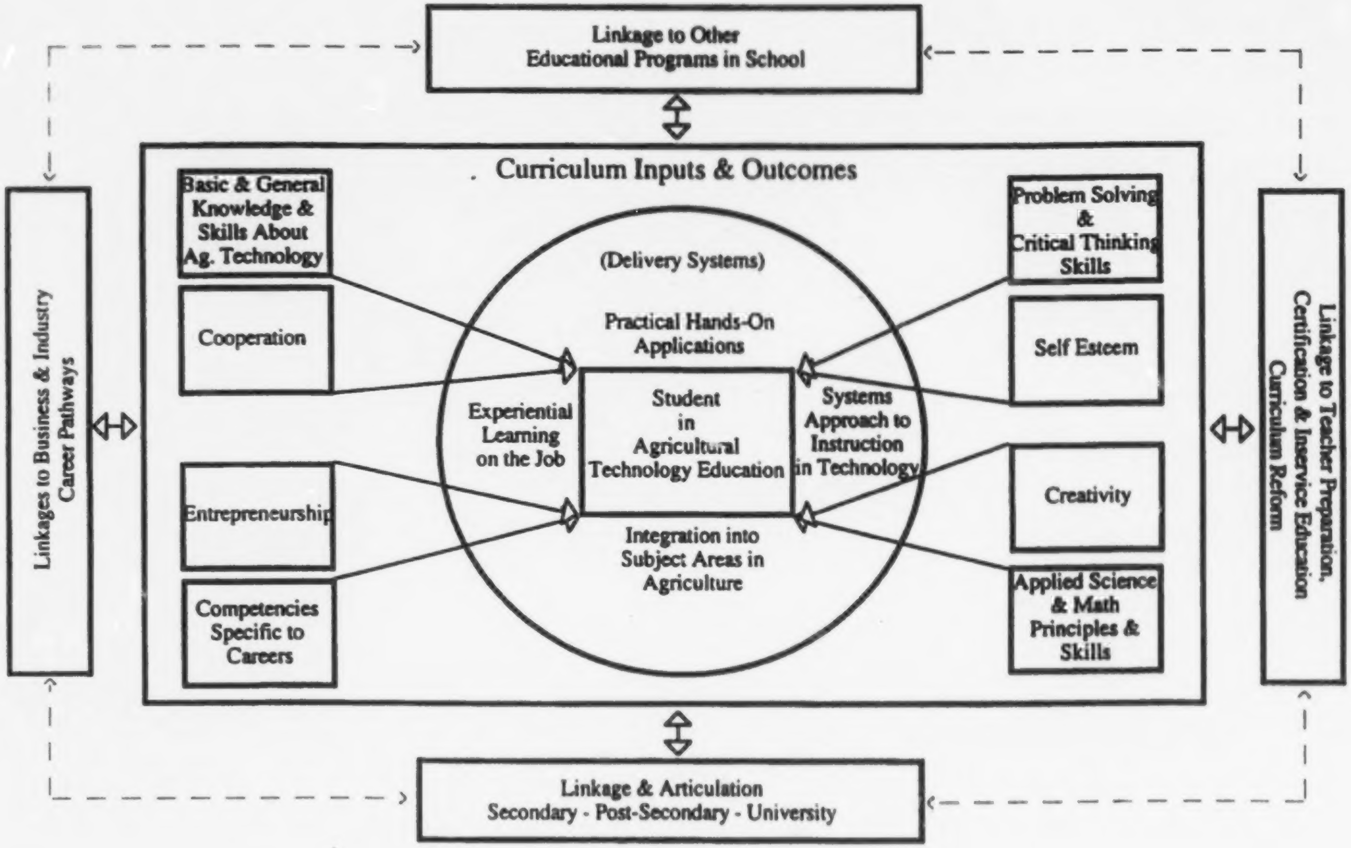
Table 1. Frequencies, percentages, means & standard deviations of perceptions regarding the role of agricultural mechanics in the agricultural education curriculum

Perception statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total n	Mean S.D.
1. Most secondary school agricultural education instructors are under pressure to reduce the amount of time for agricultural mechanics instruction.	11 5%	54 25%	54 25%	69 32%	27 13%	215	3.22 1.11
2. Stand-alone courses in agricultural mechanics are critical components of agricultural education programs.	1 1%	23 11%	43 20%	90 42%	59 27%	216	3.85 .96
3. Agricultural mechanics concepts and skills should be integrated into other agriculture courses in the program.	0 0%	17 8%	41 19%	113 53%	44 21%	215	3.86 .83
4. There should be a reduced emphasis in agricultural mechanics instruction on subject content areas relating specifically to production agriculture.*	31 14%	97 45%	43 20%	43 20%	2 1%	216	2.48 1.00
5. Courses in agricultural mechanics at the secondary level should primarily emphasize the development of employment skills.	5 2%	48 22%	51 24%	91 42%	20 9%	215	3.34 1.00
6. Instruction in agricultural mechanization should focus on developing general knowledge and skills that are transferable to a wide range of job clusters rather than specific knowledge and skills that focus on a specific job in a job cluster.	0 0%	12 6%	19 9%	135 63%	49 23%	215	4.03 .74

Table 1. Continued

Perception statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total n	Mean S.D.
7. High school students need an opportunity to design, build, and take home projects involving good craftsmanship to develop healthy self-concepts, self-esteem, and pride in quality workmanship.	0 0%	5 2%	11 5%	107 50%	93 43%	216	4.33 .68
8. Instruction in agricultural mechanics should be modeled around a systems concept that addresses basic systems found in complex machines such as fluid power systems, electrical systems, water systems, etc. rather than the traditional areas such as concrete and masonry, hot and cold metals, tractor mechanics, etc.	11 5%	49 23%	59 27%	81 38%	16 7%	216	3.19 1.03
9. Courses in agricultural mechanics at the secondary level should be science-based, applied physics with applications in agriculture.	5 2%	34 16%	66 31%	95 44%	16 7%	216	3.38 .92
10. Agricultural mechanics instruction in most high school agricultural education programs adequately addresses the educational needs of both college bound and non-college bound students.	6 3%	52 24%	65 30%	85 39%	8 4%	216	3.17 .93

Scale 5 = Strongly Agree; 1 = Strongly Disagree
* Item reverse scored.


Linkage to Other
Educational Programs in School
Curriculum Inputs & Outcomes
Basic & General Knowledge & Skills About Ag. Technology
Cooperation
Entrepreneurship
Competencies Specific to Careers
(Delivery Systems)
Practical Hands-On Applications
Experiential Learning on the Job
Student in Agricultural Technology Education
Systems Approach to Instruction in Technology
Integration into Subject Areas in Agriculture
Problem Solving & Critical Thinking Skills
Self Esteem
Creativity
Applied Science & Math Principles & Skills
Linkages to Business & Industry
Career Pathways
Linkage to Teacher Preparation, Certification & Inservice Education
Curriculum Reform
Linkage & Articulation
Secondary - Post-Secondary - University

Curriculum Model for Agricultural Technology Education (CMATE)

Technology Education (CMATE) within secondary agricultural education programs, is presented in Figure 1. The researchers used the name "Agricultural Technology" as opposed to "Agricultural Mechanization." Previous studies (Eighmy, 1995; Shinn, 1995) stated that a more modern descriptor would help the image of agricultural "mechanics"; the researcher agreed that the term "technology" was more all-encompassing than "mechanics."

The student in agricultural technology education is located at the heart of the model with all its components focused on the student's education. The circle around the student encompasses the delivery systems which include:

1. Practical hand-on applications
2. Experiential learning on the job
3. Systems approach to instruction in technology
4. Integration into subject areas in agriculture.

The first component, "Practical hands-on applications," requires that the students are given the opportunity to actually engage in learning through practical applications of the concepts learned. Designing and building appropriate projects would be an example.

The second component, "Experiential learning on the job," is tied very closely to practical application. However, efforts should be made by the instructor to simulate the "on the job" aspect of this component. Lawn mowers could be brought in for repairs and/or maintenance, or in a greenhouse situation, ornamental plants could be grown for sale to the local community. Either example could be simulated using a business-type atmosphere.

The third component, "Systems approach to instruction," involves teaching the interrelated concepts together rather than as individual units. A greenhouse example could show how watering of plants affects the heating and cooling system.

The fourth component, "Integration into subject areas in agriculture," involves integrating agricultural technology throughout the agricultural education curriculum. A horticulture class offering instruction in operation and maintenance of small engine power equipment (lawn mowers, rototillers, etc.) used in routine maintenance of a landscaped areas would be an example of this.

All curriculum inputs and outcomes must be concerned with as many of the four areas within the delivery system as possible. Utilizing different methods of delivering subject matter or developing skills helps to insure that the students can apply what they have learned in various situations.

The large rectangular box entitled "Curriculum Inputs and Outcomes," encompasses input areas of instruction as determined by desired curriculum outcomes within an institution's mission and philosophy. The eight distinctive components of curriculum identified in this model that should be incorporated into every subject area taught included:

1. Basic and general knowledge and skills about agricultural technology
2. Cooperation
3. Entrepreneurship
4. Competencies specific to careers
5. Problem-solving and critical thinking skills
6. Self esteem
7. Creativity
8. Applied science and math, principles and skills.

Basic and general knowledge and skills about agricultural technology involves instruction in a wide range of information about agricultural technology. Development of student awareness involves general instruction in agricultural technology and its relationship to other areas of agriculture, as well as other areas of general education. Eighty-six percent of the respondents agreed that instruction in agricultural mechanization should focus on developing general knowledge and skills that are transferable to a wide range of job clusters.

Cooperation and entrepreneurship are both focused on the development of interpersonal skills. Business atmosphere includes these skills and companies are looking for recruits who possess these on a high level. Small group projects define the spirit of cooperation and are excellent learning situations in which to develop these skills.

Competency Based Education has been the most widely used, traditional method of teaching agricultural mechanization. Students progress at their own rate and a variety of learning activities and experiences can be utilized. Competencies in this component area focus on preparing the student for specific career goals.

The fifth component, "Problem-solving and critical thinking skills," are taught to increase a student's ability to make well-informed decisions. The systems approach to instruction focuses on the decision-making process by applying "decision rules," choosing one alternative, reviewing it, and finally deciding for or against the choice.

Self-esteem and Creativity are both focused on the development of personal skills and are necessary components in any learning environment. Personal skills can be assessed by the use of the authentic assessment method where instructors can monitor student performance individually and/or collectively; observing, assisting, and assessing continually throughout the learning process.

The last component within curriculum inputs and outcomes is "Applied Science and Math Principles and Skills," and involves utilizing these principles and teaching the "how" and "why" of the way things work. Students learn the science, physics or mathematical principles behind a concept, then the skills to apply those concepts. Osborne (1992, March) stated, "A new emphasis on physical science applications in agriculture will diversify agricultural mechanics instruction and appropriately maintain agricultural mechanics as an important component of secondary agricultural education" (pp. 3-4).

Encompassing the "Curriculum Inputs and Outcomes" section of the model are four distinct linkages which work together to provide the structural support needed. These linkages include:

1. Linkage to other educational programs in school.
2. Linkage to teacher preparation, certification and in-service education, curriculum reform.
3. Linkage and articulation, secondary-post-secondary-university.
4. Linkages to business and industry, career pathways.

The linkage to other educational programs within the school itself is imperative. Subject areas must have an understanding of how their contributing to the overall education of the student and when combined together provide the best possible educational program.

The second linkage is essential to the implementation of the model. Acceptance of curricular reform is slow at best; if the reform is too radical, it will not be adopted. Therefore, it is imperative that through in-service education, teachers are assisted in applying the model to their existing program. Not all parts of the model must be used in every course taught, but as many parts of the model that can be implemented should be. Through teacher certification programs, new teachers can become familiar with the model and its application in agricultural technology.

The third linkage, "Articulation between secondary, post-secondary and university programs," involves communication between the three entities to share ideas and concerns, to assist in implementation of the components of the model, to revise and improve components of the model, and to insure that knowledge and new developments are shared between educators at these levels.

The linkage to business and industry which provide the career pathways involves providing dialogue and action between the groups to make possible the experiences in education that provide authentic meaning for students. An example of a linkage with business would be through an apprentice program for students, which would provide an experiential learning opportunity for the student, and a better prepared possible future employee for the business.

The dotted lines which tie the linkage areas together show that communication should travel throughout all the linkage entities.

Conclusions/Recommendations/Implications

About half of the respondents agreed that most secondary school agricultural education instructors are under pressure to reduce the amount of time for agricultural mechanics instruction. As instructors are budgeting their time in content areas, clearly the areas thought to be most important will receive the most instruction time.

It was evident that secondary instructors favored keeping stand-alone courses in agricultural mechanization, however they also felt that integration with other content areas was desirable as well.

The respondents in this study clearly perceived that production agriculture applications of agricultural mechanics are still a very viable and important part of their programs.

Statement number six read, "Instruction in agricultural mechanization should focus on developing general knowledge and skills that are transferable to a wide range of job clusters rather than specific knowledge and skills that focus on a specific job in a job cluster." Instructors highly agreed with this statement. Kennedy (1993) in Preparing for the Twenty-First Century, stated that as technological innovations create new jobs and destroy old ones, we will need to rethink, retrain, and retool for the future. Teaching general knowledge and skills that transfer to a wide range of job clusters will provide a more viable education for today's student.

Today's students will most likely change jobs numerous times during their working careers. Osborne (1992) called for a shift from a product focus to a process focus within agricultural mechanics instruction. Understanding the big picture, the process behind "why" a practice or skill is performed, and then being able to apply that knowledge and skill in various ways, are the tools with which we want to equip today's students.

Respondents overwhelmingly agreed with perception statement number seven, "High school students need an opportunity to design, build, and take home projects involving good craftsmanship to develop healthy self-concepts, self-esteem, and pride in quality workmanship." Agricultural education has been a hands-on, learning by doing program since its inception. That is one of the strengths of the program. By applying the knowledge and skills students have acquired to a project personally appealing to that student, education becomes real and useful. Experiential learning is exemplified in the designing and building of projects. In Shinn's (1995) study, current strengths of the agricultural mechanics program were identified as continuing active learning by doing and developing positive self-esteem among all students, especially under-achievers. Clearly, the use of appropriate projects is a way of providing this type of education, as the vast majority of the respondents indicated.

Respondents supported the concept that subject matter content must ideally focus on universal systems found in complex agricultural machines and structures, rather than the traditional self-contained areas of study used in the past.

The majority of instructors (51%) agreed with statement number nine, "Courses in agricultural mechanics at the secondary level should be science-based, applied physics with applications in agriculture." Current literature (Eighmy, 1995; Buriak, 1992; Lawver & Fraze, 1992; Osborne, 1992) overwhelmingly supports this statement, and many agricultural educators are calling for this to be the major focus of curricular reform.

Based on the findings and conclusions of the study, the researchers made the following recommendations:

1. Continue to include agricultural mechanization instruction as a part of the secondary agricultural education curriculum, with revisions reflected in the Curriculum Model for Agricultural Technology Education.
2. Implement and use the CMATE model in secondary agricultural education. The model should be used in all courses in agricultural technology.
3. Develop instructional materials for topics that are increasing in importance such as computers, emerging technologies, science and math-based applications.
4. Develop instructional materials for teaching utilizing the systems approach, problem-solving and critical thinking skills.
5. Develop ways to integrate agricultural technology into the other occupational areas within agricultural education.
6. Develop ways to integrate the agricultural technology curriculum within other curricular areas.
7. Provide in-service education opportunities in agricultural education for teachers of agriculture to expand instruction in selected areas of agricultural mechanization.

Implications to teacher education programs from this study include the continued view of agricultural mechanization as an integral part of agricultural education, and that adequate educational opportunities in agricultural mechanization must be provided. This view would embrace the addition of a course in methods in laboratory instruction. The course would focus on planning, delivery, and evaluation of instruction in laboratory settings such as shops, greenhouses, and technology laboratories. Students should not be allowed to certify as qualified secondary agricultural educators without being properly educated in how to teach in a laboratory setting.

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The Role Of Agricultural Mechanization In The Secondary Agricultural Education Curriculum As Viewed By Agricultural Educators

A Critique

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As secondary agriculture programs continue to evolve, a new understanding of the role of agricultural mechanization in the curriculum is needed. What has traditionally been taught may no longer be relevant. This study sought to describe secondary agriculture teacher perceptions of selected agricultural mechanization concepts and to design a practical curriculum model. I believe that the authors were successful in achieving the objectives of the study and used acceptable research procedures. The population included teachers in 12 states of the central region. The researchers used appropriate sampling methods and controlled for non-response error. Results are therefore generalizable to the region. The only procedural concern that I have with the study concerns the failure to report an estimate of the reliability of the instrument used. The most significant contribution to the agricultural education profession that this study offers is the Curriculum Model for Agricultural Technology Education (CMATE). In my opinion, this model can be applied to secondary agriculture curriculum overall. I raise the following questions for clarification and/or discussion:

1. The researchers cite the National Research Council (1988) as a prominent study addressing changes in agricultural mechanization but only report findings concerning secondary agriculture programs overall. Did this study actually address agricultural mechanization specifically and if so how? Also, the statement that the "content of today's vocational agriculture programs is out of date" was attributed to the NRC report. Is the NRC's (1988) study relevant to today's programs?
2. The researchers state that there is a need for change in the agricultural mechanics curriculum. There has been input from teacher educators, administrators, and now teachers. Are these groups the right source of information for decisions about curriculum innovation in agricultural mechanization? How important are the needs and interests of agricultural industry?
3. The researchers report that a consensus was reached in support of the statement that read "High school students need an opportunity to design, build, and take home projects involving good craftsmanship to develop healthy self-concepts, self-esteem, and pride in quality workmanship." A conclusion concerning the importance of projects based on this consensus is drawn. Was there really a consensus that student projects are needed or were respondents really agreeing with all of the wonderful things associated with projects in the statement?
4. How innovative is the curriculum model? How does it differ from current

Concurrent Session G

Theme:
Agricultural Science and Special Populations

Implications of Integrating Science in Secondary Agricultural Education Programs
Gregory W. Thompson, Oregon State Univ.
Leon G. Schumacher, University of Missouri

Chairperson:
B. Allen Talbert
Purdue University

Method of Reinforcement and Student Gender: Effects on Achievement in Agriscience Education
Donald M. Johnson, University of Arkansas
George W. Wardlow, University of Arkansas
Timothy D. Franklin, University of Arkansas

Discussant:
Connie D. Baggett
The Pennsylvania State University

Practices, Perceptions, and Plans: A Description of a Select Population of Secondary Agricultural Educators
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Implications Of Integrating Science In Secondary Agricultural Education Programs

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Introduction/Theoretical Framework

Educational initiatives (A Nation at Risk, 1983; The Unfinished Agenda, 1984; An Imperiled Generation: Saving Urban Schools, 1988) have called for educators to find ways for students to learn more effectively and more efficiently. The A Nation at Risk report alarmed many Americans with students' low levels of basic skill performance in science (National Commission on Excellence in Education, 1983). Ten years later, results of the International Assessment of Educational Progress (Science), as reported in USA Today ("Riskline" 1993) found U.S. students ranked 13 out of 15 participating countries. These low science scores resulted in a demand for improved science education for American students.

In response, educational policy makers increased graduation requirements in the basic skills in an attempt to improve students' academic knowledge and stimulate higher order thinking (Case, 1986; Wirt, 1991). Jennings (1991) contended that raising academic standards has not been effective for most students who perform poorly in academic settings. In an interview by the New York Times (1990), George Tressel of the National Science Foundation pointed out that the general idea in present science education has been: "Don't educate them better: raise the standards, filter harder. We've gotten so good at weeding out that no one's left" (p. B-18).

Wirth (1992) painted the delivery of science as a depressing picture when he cited evidence that large numbers of American students avoided science in both secondary and higher education. Cole (1990) agreed, "Science education in the United States right now is largely a misnomer. It has little to do with science as scientists practice it, nor does it seem to educate anyone particularly well" (New York Times, p. B-18).

The National Science Board Commission on Precollege Education in Mathematics, Science, and Technology (1983) joined in stating an urgent need for curricula that utilized science and math applications in practical situations to improve student learning. The American Association for the Advancement of Science began a major effort to improve the delivery method of science education through Project 2061, science for all Americans (1989). Teachers and administrators devised the science curriculum to encourage students to make their own discoveries instead of reading about them in a book.

Policymakers, educators, employers, scholars, and social critics have advocated vocational education reform that dealt with "integration" (Stasz, Kaganoff, & Eden, 1994). According to researchers (Stasz and Grubb, 1991; O'Neil, 1992), vocational educators as well as critics of vocational education viewed integration of academics as a curricular reform that improved the academic content of vocational education and helped prepare students for employment in an ever-changing world of work.

In recent years, Agricultural Education Programs have faced a lack of stability in enrollments, a shifting of the job structure in the agriculture industry, and changing clientele in agricultural education (National Research Council, 1988). The agricultural industry anticipated a decrease of 163,000 agricultural production related jobs from 1987 to the year 2000 according to the Monthly Labor Review (1987). During the same period, it was anticipated that 47,000 farm manager positions would be created and life science jobs were expected to increase by 21%. This increase represented approximately 30,000 new science oriented jobs such as plant and animal genetics, biotechnology, and medicine (Silvestri and Lukasiewicz, 1987).

The National Research Council (1988) reported that much of the curriculum in agricultural education programs was outdated and additional science-based curriculum should be incorporated. According to Budke (1991), agricultural education provided an excellent means to teach biological sciences such as genetics, photosynthesis, nutrition, pollution control, water quality, reproduction, and food processing. The use of live examples as a part of the classroom for experimentation and observation provided an effective method to teach science concepts (Budke, 1991).

Many agriculture teachers were reluctant to change traditional agriculture programs because they believed integrating too much science into the curriculum may threaten the program (Whent, 1992). To assist in developing programs that integrate science into agricultural education, knowledge must be gathered about the perceptions and beliefs of teachers with exemplary agriscience programs.

In a 1995 study, Johnson reported that Arkansas agriculture teachers perceived offering science credit for agriculture courses would increase enrollment, benefit students, and enhance the program image. Researchers (Roegge and Russell, 1990; Whent and Leising, 1988; Enderlin and Osborne, 1992; Connors and Elliot, 1995) found that students who have been taught science using agriculture and natural resources perform equally well or better than students who have been taught science using traditional instructional methods.

Duval (1988) stated that the AgriScience Teacher of the Year Award Program recognized outstanding agricultural educators who emphasized agriscience technology in their curriculum. "The program has surfaced some of the finest agriscience programs in the country. They have recognized the need for retaining the assets of today's vocational agriculture program, leadership training and SOE programs, while placing renewed emphasis upon the scientific and technological aspects of agriculture" (p. 20).

The educational reform movement has led to rapid changes in education and agricultural education. One result of the changes in agricultural education has been the establishment of the new FFA Award Programs to recognize teachers in agriscience and technology. Few studies have been conducted to evaluate the agriscience programs and ascertain the perceptions of these award winning agriscience teachers. This study provided information about perceptions of teachers who have been recognized as state, regional, and national winners of the FFA AgriScience Teacher of the Year Award Program. The results of this study will provide the agricultural education profession with information that will be useful in providing direction of science and technology in agricultural education.

Non-random "purposive sampling" as described by Kerlinger (1986) was used to specifically study agricultural education teachers that were considered to be the most effective in integrating science into the agricultural education curriculum. Purposive sampling was used in this study as it identified exemplary agriscience teachers in the nation as identified by their state leadership and the National FFA Organization. Moore (1994) stated, "There are times when selecting purposive samples would do more to advance the profession than selecting random samples. At times we need to identify the best programs, best teachers, and best FFA Chapters and study them in detail" (p. 11).

Purpose/Objectives

The purpose of this study was to determine how agriscience teachers perceived the impact that integrating science has had on their agricultural education program. To fulfill the purposes of the study, the following research questions were addressed to state, regional, and national winners of the National FFA AgriScience Teacher of the Year Award Program:

1. What were the perceptions of agriscience teachers concerning integrating science and agriculture?
2. What were the perceptions of agriscience teachers concerning teaching integrated science?
3. What were the perceived barriers to integrating science into the agricultural education program?
4. What were the agriscience teachers' perceptions concerning the role of teacher preparation programs in integrating science into agricultural education programs.
5. What were the agriscience teachers' perceptions concerning student enrollment since integrating science into their agricultural education program?
6. What were the agriscience teachers' perceptions concerning support of the agricultural education program since integrating science?

Methods/Procedures

The target population of this study consisted of all state, regional, and national winners of the National FFA AgriScience Teacher of the Year Award Program from the years 1988 - 1995 (N = 253). The accessible population was limited to agriculture teachers whose names were provided by the National FFA Organization and consisted of all available records of AgriScience winners that were still teaching. The list of names and addresses was cross-referenced with the Agricultural Educators Directory (1995) to determine if they maintained the same address and/or school since winning their respective AgriScience Teacher of the Year Award. If the agriscience teacher was not listed as currently teaching at the same school, the Agricultural Educators Directory (1995) was used to verify if the teacher was teaching in the same state. Finally, the National Vocational Agriculture Teachers Association (NVATA) office verified if individuals whose names were not listed in the Agricultural Educators Directory (1995) were members of the NVATA. If the teacher's name was not found in the Agricultural Educators Directory (1995) or in the membership records of NVATA, they were eliminated from the sample. AgriScience winners who no longer taught at the secondary level, were also eliminated from the sample. A purposive sample of 187 teachers that were still teaching were identified from the population for inclusion in the study.

The survey instrument was constructed based on a review of the literature and examined by a panel of experts for content validity and readability. The panel of experts consisted of members of the agricultural education profession representing teachers, state supervisors, teacher educators, and National FFA Organization staff (n = 7). The instrument was pilot tested with a sample of teachers (n = 16) to gain insight on clarity, appropriateness, reliability, and validity. The results of the pilot test indicated that only formatting and clarification changes were needed. Cronbach's alpha coefficient was .88 for the pilot test.

The survey instrument and cover letter were mailed to the subjects with a self-addressed, stamped return envelope. Two weeks after the initial mailing, a reminder post card was sent to non-respondents. After another two-week waiting period, a telephone call was placed to all non-respondents by using a phone number that was obtained through the internet (WWW.Swithboard.com, 1996). A new cover letter with a survey instrument and return envelope was mailed to those individuals who indicated that they had misplaced or discarded the original survey instrument. Usable responses were received from 131 teachers for an overall response of 71.98 percent.

Results/Findings

The respondents were asked to respond to 38 statements regarding integrating science into their Agricultural Education Programs. Their responses were measured using a five point Likert-type scale where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree. Cronbach's alpha coefficient revealed an item reliability ranging from .80-.81. Cronbach's alpha reliability of the 38 scaled items was .81.

The raw mean scores on the 38 Likert-type items ranged from a low mean of 2.55 for the item, "the lack of a science teacher who is willing to help me integrate science concepts has been a barrier to integrating science in the agricultural education program" to a high score of 4.65 for the item "people pursuing a career in agriculture must have a greater understanding of biological science than ten years ago." The respondents rated 15 (37.5%) of the items 4.00 or higher while 34 (90%) of the items received mean ratings of 3.00 or higher. Only four (10%) of the items received a mean score less than 3.00.

Table 1 presents the means and standard deviations for agriscience teachers' perceptions of integrating science. Research question number 1, "Agriculture and Science" contained seven items with mean scores that ranged from 3.82 - 4.65. The items within this category had the highest mean scores for the six categories with only one item that had a mean below 4.00.

Research question number 2, "Teaching Integrated Science" contained six items with mean scores that ranged from 3.28 - 4.18 (Table 2). The respondents agreed (a mean greater than 4) with statements regarding feeling prepared to teach integrated biological science concepts, more preparation time required to integrate science, and that they teach more biological than physical science concepts.

Table 1

Means (M) and Standard Deviations (SD) for Agriscience Teachers' Perceptions of Integrating Science and Agriculture (N = 130)

Agriculture and Science Item	M	SD
People pursuing a career in agriculture must have a greater understanding of biological science than ten years ago.	4.65	.52
Students are more aware of the connection between scientific principles and agriculture when science concepts are an integral part of their instruction in agricultural education.	4.56	.60
Students are better prepared in science after they completed a course in agricultural education that integrated science.	4.45	.67
Students learn more about agriculture when science concepts are an integral part of their instruction.	4.40	.73
Science concepts are easier to understand for students since I integrated science into the agricultural education program.	4.39	.66
People pursuing a career in agriculture must have a greater understanding of physical science than ten years ago.	4.33	.73
Students are more motivated to learn since I integrated science into the agricultural education program.	3.82	.83

Table 2

Means (M) and Standard Deviations (SD) for Agriscience Teachers' Perceptions Toward Teaching Integrated Science in Their Agricultural Education Program (N = 130)

Teaching Integrated Science Item	M	SD
I feel prepared to teach integrated biological science concepts.	4.18	.74
Integrating science into the agricultural education program requires more preparation time for me than before I emphasized integrating science concepts in my agricultural education program.	4.18	.84
I teach integrated science concepts in agricultural education that focus more on the biological science concepts than the physical science concepts.	4.13	.78
Integrating science into agriculture classes has increased my ability to teach students to solve problems.	3.90	.72
I feel prepared to teach integrated physical science concepts.	3.89	.83
I have integrated more science in the advanced courses than the introductory courses that I teach in agricultural education.	3.28	1.13

Research question number 3, "Barriers to Integrating Science" contained nine items with mean scores that ranged from 2.55 - 3.99 (Table 3). No items in this category received mean scores above 4.00. This category also had the lowest mean scores. As indicated by the data, the respondents were undecided (a mean greater than 3 and less than 4) with statements regarding barriers to integrating science.

Table 3

Means (M) and Standard Deviations (SD) for Perceived Barriers in Integrating Science Into the Agricultural Education Program (N = 130)

Barriers to Integrating Science Item	M	SD
The lack of appropriate equipment is a barrier to integrating science into the agricultural education program.	3.99	1.00
The lack of adequate federal, state, or local funds is a barrier to integrating science in the agricultural education program.	3.56	1.23
The lack of agriscience inservice workshops/courses for agricultural education teachers is a barrier to integrating science into the ag. ed. program.	3.50	1.11
The lack of close proximity to high-technology firms is a barrier to integrating science in agricultural education programs.	3.25	1.07
The lack of science competence among teachers in agricultural education is a barrier to integrating science in agricultural education.	3.13	1.11
The lack of an integrated science curriculum is a barrier to integrating science into the agricultural education program.	3.04	1.08
The lack of agriscience jobs in the local community is a barrier to integrating science into agricultural education programs.	2.90	1.09

Table 3 continued

Barriers to Integrating Science Item	M	SD
The lack of student preparation (prior to enrolling in agricultural education) in science is a barrier to integrating science into agricultural education programs.	2.86	.99
The lack of a science teacher who is willing to help me integrate science concepts has been a barrier to integrating science in the ag. ed. program.	2.55	1.21

Research question number four, "Teacher Preparation Programs" contained five items with mean scores that ranged from 3.46 - 4.44 (Table 4). Agriscience teachers agreed (mean scores greater than 4) that teacher preparation programs should provide inservice for teachers and instruction for undergraduates on how to integrate science. Agriscience teachers also agreed (mean scores greater than 4) that student teachers and students in early field experience programs should be placed with teachers that integrate science into their agricultural education program.

Table 4

Means (M) and Standard Deviations (SD) for Agriscience Teachers' Perceptions Concerning the Role of Teacher Preparation Programs in Integrating Science in Agricultural Education Programs (N = 130)

Agriculture and Science Item	M	SD
Teacher preparation programs should provide inservice for teachers in the field on how to integrate science into their agricultural education program.	4.44	.56
Teacher preparation programs in agriculture should provide instruction for undergraduates on how to integrate science.	4.38	.67
Teacher preparation programs in agriculture should place student teachers with a cooperating teacher that integrates science into the ag. ed. program.	4.19	.73
Teacher preparation programs should require that students conduct their early field experience program with a teacher that integrates science into the agricultural education program.	4.05	.70
Teacher preparation programs in agriculture should require students to take more basic science courses.	3.46	1.03

Research question number five, "Student Enrollment" contained five items with mean scores that ranged from 2.89 - 4.07 (Table 5). Only two statements had mean scores that were over 4.0. Agriscience teachers had high mean scores (greater than 4.0) in increased program enrollment and that high ability students are more likely to enroll in agricultural education courses that integrated science into the curriculum.

Table 5

Means (M) and Standard Deviations (SD) for Agriscience Teachers' Perceptions Concerning Student Enrollment Since Integrating Science into Their Agricultural Education Program (N = 130)

Student Enrollment	Item	M	SD
High ability students are more likely to enroll in agricultural education courses that integrate science.		4.07	.89
Total program enrollment in agricultural education has increased since I integrated science.		4.03	.87
Average ability students are more likely to enroll in agricultural education courses that integrate science.		3.71	.85
Integrating science into the agricultural education program more effectively meets the needs of special population students.		3.19	1.02
Low ability students are more likely to enroll in agricultural education courses that integrate science.		2.89	1.15

" Program Support" contained six items with mean scores that ranged from 3.51 - 3.79 (Table 6). No items in this category had a mean score above 4.00. The respondents were undecided (mean scores greater than 3 and less than 4) as to groups of people that have increased support since integrating science into the agricultural education program.

Table 6

Means (M) and Standard Deviations (SD) for Agriscience Teachers' Perceptions Concerning Program Support Since Integrating Science into Their Agricultural Education Program (N = 130)

Program Support	Item	M	SD
Local administrator support has increased since I have integrated more science into the agricultural education program.		3.79	1.01
Parental support has increased since I have integrated more science into the agricultural education program.		3.68	.79
Community support has increased since I have integrated more science into the agricultural education program.		3.65	.84
School counselor support has increased since I have integrated more science into the agricultural education program.		3.64	.94
Science teacher support has increased since I have integrated more science into the agricultural education program.		3.60	1.10
Other teacher support has increased since I have integrated more science into the agricultural education program.		3.51	.86

Conclusions/Recommendations/Implications

The conclusions of this study were based on the responses of the winners of the National FFA AgriScience Teacher of the Year Awards Program from 1988-1995. Although other agricultural education programs that integrate more science may have similar characteristics, caution must be exercised when generalizing the results of this study beyond the population. Based on the findings of this study, the following conclusions were formulated:

1. Agriscience teachers believed that integrating science assists students in better understanding science concepts and their application to agriculture. This concurs with the findings of Enderlin and Osborne (1992) that integrating more science will produce more science literate students that are better prepared to compete in today's society.

2. Agriscience teachers indicated that they need more preparation time than before they emphasized integrated science concepts. Agriscience teachers also feel better prepared and indicated that they teach more biological science concepts than physical science concepts in their curriculum.

3. Undergraduates will be better prepared to teach if they receive instruction on how to integrate science and if they student teach with a cooperating teacher that integrates science. Agriscience teachers also believe that teacher preparation programs should provide inservice for teachers on how to integrate science.

4. Agriscience teachers perceived that total program enrollment, and more specifically the number of high ability students, will likely increase as agriscience teachers integrate more science into their agricultural education program. This finding supports the conclusion of Johnson (1995) that Arkansas teachers perceived that offering science credit for agriculture courses would increase enrollment, benefit students, and enhance the program image.

Recommendations

1. Inservice programs should be offered to assist teachers in integrating science into the agricultural education curriculum. Inservice programs should target specifically in integrating the physical sciences into the agricultural education program.

2. Administrators should schedule planning time for teachers to better prepare them to integrate science. The profession should initiate an effort to educate administrators that time demands to integrate science are significant.

3. Teacher Preparation Programs must identify and use teachers in the state that are integrating science into their curriculum as cooperating teachers and placement centers for student teachers and early experience students.

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Implications Of Integrating Science In Secondary Agricultural Education Programs

A Critique

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Integrating science in secondary agricultural education? What does this really mean? Does it mean that secondary agricultural teachers should teach the basic understanding of scientific theories and principles? Does it mean that secondary agricultural teachers should teach biology, chemistry, physics, or astronomy? Does it mean that secondary agricultural teachers should teach agronomy, entomology, plant science, animal science or forestry? The review of literature in the theoretical framework did not make this clear to the reader. When I arrived at the last paragraph of this section, I was truly confused when I started reading "Non-random 'purposive sampling' ....." Can we accomplish good research without a complete and sound theoretical framework?

If we assume that integrating science in secondary agricultural education as including those scientific theories and principles as we teach the theories, principles, and practices of the agricultural sciences, then we can continue with other aspects of this research. There were six objectives of this study that seem to require 38 statements to gather data. Could this long questionnaire influence the 71.9 percent return rate? What about the non-respondents? Were they different from those who returned their questionnaire. How would you know if differences existed without some comparison across selected variables or statements. If one were to tie this shortcoming with a Cronbach alpha of .81 or 65% of accountable variance, any findings obtained become suspect. In describing the instrument development, the researchers should revisit the statement "The results of the pilot test indicated that only formatting and clarification ERRORS were need."

The data presented and discussed were easy to follow and understand. The researchers included means and standard deviations that are appropriate indicators of population parameters. The 38 statements were grouped in barrels of like concerns and no attempt was made to misconstrue them as factors. Likewise, the conclusions followed in a sequential and methodical direction until I reached #3-- "Undergraduates will be better prepared to teach if they receive instruction on how to integrate science and if they student-teach with a cooperating teacher (who) integrates science." I could not find the data to support this statement.

As this study used only "all state, regional, and national winners of the National FFA AgriScience Teacher of the Year Award Program," I wonder how non-winners would respond to these same statements. Are these winners different from non-winners who were applicants? Are non-applicants different from applicant non-winners? Are non-applicants different from winners? In short, are these findings universal or unique to winners only. This is fertile grounds for future research.

Method of Reinforcement and Student Gender: Effects on Achievement in Agriscience Education

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Introduction/Theoretical Framework

Agricultural education programs in the public schools are changing in order to meet the needs of both students and society (Hughes and Barrick, 1993). One recent change is an increased emphasis on instruction in agriscience (Camp, 1994). According to Buriak (1989, p.4) agriscience is defined as, "Instruction in agriculture emphasizing the principles, concepts, and laws of science and their mathematical relationships supporting, describing, and explaining agriculture." Lee (1994, p.2) described agriscience education, "The emphasis is on the principles of science that undergird agriculture."

One of the primary purposes of agriscience is to provide students with a hands-on, application-oriented science education (Lee, 1994). Such a purpose is consistent with the constructivist approach to science education, which emphasizes the importance of concrete physical experiences in learning science concepts and principles (Brooks and Brooks, 1993; Fensham, 1992). Agricultural educators have traditionally espoused a "hands-on" approach to teaching and learning (Newcomb, McCracken and Warmbrod, 1993; Phipps and Osborne, 1988). Yet, in traditional programs, many of the hands-on activities have been intended to allow students to develop the procedural and psychomotor skills deemed necessary for success in agricultural occupations (Johnson, 1989). Agricultural educators have placed considerably less emphasis on the use of hands-on activities as a method for teaching and/or reinforcing student learning of science principles.

According to Enderlin and Osborne (1992, n.p.), "Changes are needed in agricultural education in order to increase students' inquiry skills and understanding of science principles as they relate to agriculture." Lee (1994, pp. 1-2) echoed this sentiment when he stated that, "Agriscience and technology require [instructional] approaches that are different from traditional agricultural education." One such instructional approach could well be the use of hands-on activities to reinforce student learning of science principles (Osborne, 1993).

Theoretical Framework

Hands-on instruction. In recent years, many major science curriculum development projects have promoted hands-on, practical activities as both an effective and enjoyable way for students to learn science content (Hodson, 1990). After a quarter of a century, the phrase "hands-on science" is part of the everyday vocabulary of science educators, particularly those at the elementary and middle school levels (Flick, 1993).

Proponents of hands-on science claim that it has several advantages when compared to more traditional forms of science instruction. According to LeBuffe (1994, p. 10), the use of hands-on activities "makes science vivid, meaningful and fun for most students." Wasserstein (1995) found that when middle school students were asked to identify their most memorable school work, a higher percentage identified hands-on science (27%) than any other topic or activity.

Although hands-on science is generally associated with elementary and middle schools, some researchers believe that a hands-on approach to teaching science is also needed at the secondary school level. According to Piburn and Baker (1993):

> Especially in the upper grades, the increasing abstraction of science content is unpleasant to students. We recommend that a conscious effort be made to identify content that has some meaning within their [the students'] everyday lives. This content should be relatively concrete and subject to physical manipulation, and teachers should be cautious, even in the highest grades, about introducing advanced axiomatic or theoretical concepts into the curriculum. (pp. 404-405)

Lehman (1989) studied a national sample of secondary school chemistry teachers and students to determine their perceptions concerning the effectiveness of laboratory activities in promoting student learning in the affective, psychomotor, and cognitive domains, as well as in the area of science process skills. A majority of respondents in both the teacher and student groups perceived that laboratory activities were effective in promoting cognitive learning (63.6% and 75.3%, respectively). Fewer teachers and students perceived laboratory activities to be effective in enhancing affective (34.1% and 22.1%, respectively), psychomotor (20.5% and 26.6%, respectively), or science process skills (20.5% and 11.5%, respectively) learning. Lehman (p. 513) concluded that, "Both teachers and students most frequently perceived cognitive advantages of laboratory activities. The notion that laboratories help students understand the abstract concepts and principles introduced in class was frequently expressed."

Despite the perceptions of both teachers and students, some critics have questioned the effectiveness of laboratory activities in promoting cognitive learning in science (Hodson, 1990; Hofstein and Lunetta, 1982; and Tobin, 1990). Based on their review of the science education research literature, Hofstein and Lunetta (1982, p. 202) concluded that, "Most ... research studies have shown no significant differences between the instructional methods [laboratory instruction vs. other methods] as measured by standard paper-and-pencil tests in science achievement." On the other hand, Hofstein and Lunetta did state that sufficient research evidence exists to support the role of laboratory activities in promoting positive attitudes toward science.

Gender differences and science achievement. Researchers have found significant differences between male and female students on science achievement. In a meta-analysis of 77 studies conducted between 1980 and 1991 among middle and high school students, DeBaz (1994) found a significant gender effect favoring males in overall science achievement.

Focusing on overall gender differences in science achievement may obscure differences between males and females in specific fields of science. In an analysis of data from the National Educational Longitudinal Study (NELS:88), Lee and Burkam (1996) found a large advantage for males on the physical science subtest and a modest advantage for females on the life science subtest. These researchers concluded that laboratory activities are beneficial for achievement among females in the physical sciences. Oakes (1990) has also noted that females are more likely to benefit from cooperative and hands-on learning activities while males benefit more from traditional instructional activities.

These same differences by gender also exist in students' out-of-school science-related experiences. Using data from the National Assessment of Educational Progress (NAEP) among students in grades seven and 11, Blosser (1990) concluded that male students were more likely than females to report having attempted to fix electrical or mechanical devices. Conversely, females were more likely than males to have attempted diagnosing problems with an unhealthy plant or animal.

Shepardson and Pizzini (1994) noted that the attitude of girls toward science is one of the factors that influences the achievement of females in science courses as well as their decision to participate in science careers. Citing the under representation of women in scientific careers, they posited that the nature of the learning situation (i.e. method of instruction) may contribute to the development of positive attitudes of girls toward science, as well as improve their educational achievement, thus, increasing participation of women in these careers. Maple and Stage (1991) suggested that gender role stereotyping may affect participation in math and science careers by white women.

Problem Statement

Research in science education is not conclusive regarding the effects of laboratory activities on student cognitive achievement in science. However, evidence does suggest that gender is related to both student achievement in science and student preference toward method of instruction in learning. While research in science education can inform the agricultural education profession as it moves toward a more science-based curriculum, specific research involving agricultural education teachers and students is needed. It is only through such research that the effectiveness of instructional practices in agriscience can be evaluated.

Purpose and Hypotheses

The primary purpose of this study was to determine the effects of two methods of reinforcement in the teaching/learning process on student cognitive achievement in two instructional areas. The study also sought to determine the effects of gender, and the interaction of gender and methods of reinforcement on student cognitive achievement. Nondirectional null hypotheses concerning student cognitive achievement were formulated for testing at the .10 alpha level and are summarized as follows:

H_{o1}: In the Ohm's Law instructional area, there will be no significant differences on either immediate or delayed cognitive achievement posttest scores based on (a) method of reinforcement, (b) gender, or (c) the interaction of method of reinforcement and gender.

H_{o2}: In the incline plane instructional area, there will be no significant differences on either immediate or delayed cognitive achievement posttest scores based on (a) method of reinforcement, (b) gender, or (c) the interaction of method of reinforcent and gender.

Methods

This section describes the methods used in conducting the study. Specific details include descriptions of the: (a) population and sample, (b) pilot-test (c) experimental design, (d) experimental procedures, and (e) instrumentation.

Population and Sample

The population for this study included all "Agricultural Science and Technology" classes within a 50 mile radius of Fayetteville, Arkansas during the spring 1996 semester. Agricultural Science and Technology is an introductory agricultural education course intended for and primarily enrolling students at the ninth grade level; however, students above the ninth grade, who have not taken the course previously, may also enroll (Arkansas Department of Education, 1992).

Seven Agricultural Science and Technology classes (from five different school districts) were purposively selected to participate in this study. The teacher of each selected class was personally contacted and agreed to participate in the study. Since these classes were selected in a purposive manner, the results of this study should not be generalized to other populations. However, the results of this study may inform decision makers in similar situations.

The total enrollment for the seven classes participating in this study was 132 students._However, due to school assemblies and individual absences, not all classes or students were included in the analyses. For the Ohm's Law experiment, two Agricultural Science and Technology classes (a total of 28 students) in two different schools did not participate because of unscheduled school assemblies which occurred during the experimental treatment period. All seven Agricultural Science and Technology classes participated in and provided usable data for the incline plane experiment.

Experimental Design

This study was conducted using a modified posttest-only control group experimental design as described by Campbell and Stanley (1966). The design was modified by incorporating a counter-balanced internal replication and a delayed posttest. According to Campbell and Stanley (1966), the posttest-only control group design controls for all threats to internal validity. Because purposive sampling was used, these results are not generalizable to other populations. Thus, questions of external validity are not pertinent.

Pilot-Test

The instructional materials, experimental procedures and research instruments used in this study were pilot-tested in two Agricultural Science and Technology classes not selected for inclusion in the main study. As a result of the pilot-test, the following changes were made: (a) the number of class periods for the Ohm's Law experiment was reduced from three to two, and (b) minor changes were made in the Ohm's Law immediate cognitive posttest. No other changes were deemed necessary based on the pilot-test.

Reliability estimates obtained on the instruments as used in the pilot-test were as follow: (a) Ohm's's Law immediate cognitive posttest, KR-21 = .68; (b) Ohm's Law delayed cognitive posttest, KR-21 = .92; (c) incline plane immediate cognitive posttest, KR-21 = .93; and (d) incline plane delayed cognitive posttest, KR-21 = .95.

Experimental Procedures

Prior to the main experiment, the researchers randomly assigned the students in each of the intact classes into one of two groups (A or B), using the official roll for each class and a table of random numbers. For the first experiment (Ohm's Law), students in the "A" group completed the worksheet activity, while students in the "B" group completed the hands-on activity. In the replication (incline plane experiment), students in the "A" group completed the hands-on activity, while students in the "B" group completed the worksheet activity.

A total of six, 50 minute periods of instruction and testing was required in each class to complete the study. The first five class periods were scheduled consecutively. These class periods were used to provide group instruction, apply the control and experimental treatments, and administer the immediate cognitive posttests. The delayed cognitive posttests were administered on the sixth class period (which occurred 16 days after the beginning of the experiment in each school).

The regular agriculture teacher provided all formal classroom instruction, following standardized lesson plans developed by the researcher and validated by a panel of experts. The classroom teacher and the researcher alternated in the supervision of students as they completed the hands-on and worksheet activities. All students were provided with identical calculators for use during each day of the study.

On the first day, each class received a 15 minute illustrated lecture on Ohm's Law and its mathematical formula. For the last 30 minutes of this class period, students in Group A remained in the classroom and completed an Ohm's Law worksheet, while students in Group B went to another location and completed a series of hands-on activities related to Ohm's Law.

The Ohm's Law worksheet consisted of 15 electrical circuit drawings. Each circuit drawing had two of the three circuit values (voltage, amperage or resistance) given. Students completed the worksheet by using the two known values and the Ohm's Law formula to calculate and record the unknown circuit value.

The Ohm's Law hands-on activity consisted of 12 stations through which the students were rotated. Each station consisted of a battery, a resistor, hook-up wires and a digital multimeter (DMM). Two of the three circuit values were given, and student was required to use Ohm's Law and the known circuit values to calculate the unknown value. Once the unknown value was calculated, the student inserted the DMM into the circuit and obtained the actual value. The student then compared the calculated and actual values to verify Ohm's Law. Each student completed a data sheet while rotating through the 12 stations. During the second class period, students completed the Ohm's Law immediate posttest was administered to the students.

On the third class period, the entire class was taught an introductory lesson on simple machines, with primary emphasis on the concepts of and formulas for calculating the theoretical mechanical advantage (TMA), actual mechanical advantage (AMA) and efficiency (E) of an incline plane. The class was taught using a lecture-discussion and demonstration format, and lasted the entire period.

On the fourth class period, students in Group B remained in the classroom and completed an incline plane worksheet. Students in Group A went to another location and completed a series of hands-on activities related to incline planes.

The incline plane worksheet consisted of 20 incline plane drawings. The data necessary for calculating the TMA, AMA or E for each incline plane were also provided. Students completed the worksheet by calculating and recording the unknown value requested in each problem.

The incline plane hands-on activity involved the use of an apparatus constructed by the researchers. The incline plane apparatus was adjustable so that three discrete base height positions could be selected. The student used a weight, tape measure and scale to collect the data necessary to calculate the TMA, AMA and E of the incline plane at each of the three base heights. One apparatus and a complete set of materials were provided for each student. Students completed a data sheet as they worked with the incline plane. On the fifth class period, students completed the incline plane immediate posttest.

On the sixth class period (16 days into the experiment), students completed the delayed cognitive posttests for both the Ohm's Law and the incline plane subject matter areas. Students were not notified in advance that the delayed cognitive posttests were to be administered.

Instrumentation

The Ohm's Law and incline plane immediate and delayed cognitive posttest instruments were developed by the researcher and validated by a panel of experts. Both Ohm's Law cognitive posttests consisted of different forms of a test having 17 mathematical word problems (in a multiple choice format with four response alternatives) and eight true-false items. Both incline plane cognitive posttests consisted of different forms of a test having 25 mathematical word problems in a multiple choice format (each with four response alternatives). The KR-21 reliability estimates for the cognitive achievement instruments used in the main study were as follow: (a) Ohm's Law immediate posttest, .80; (b) Ohm's Law delayed posttest, .79; (c) incline plane immediate posttest, .88; and (d) incline plane delayed posttest, .86.

Results

Descriptive statistics for the Ohm's Law experiment and the incline plane replication are presented in Tables 1 and 2, respectively. Cognitive post-test scores were converted to a 100 point basis prior to analysis.

Table 1: Descriptive Statistics for Cognitive Achievement on Ohm's Law Subject Matter by Method, Gender, and Method by Gender.

Method	Immediate post-test			Delayed post-test		
Gender	n	$\bar{x}$	S.D.	n	$\bar{x}$	S.D.
Hands-on	53	73.74	17.53	48	62.67	21.51
Worksheet	44	73.36	16.97	38	63.16	21.33
Male	68	71.47	18.57	62	59.48	22.36
Female	29	78.48	12.35	24	71.67	15.46
Hands-on						
Male	37	71.24	19.73	34	58.47	23.28
Female	16	79.50	8.99	14	72.86	11.76
Worksheet						
Male	31	71.74	17.40	28	60.71	21.56
Female	13	77.23	15.86	10	70.00	20.15

Table 2: Descriptive Statistics for Cognitive Achievement on Incline Plane Subject Matter by Method, Gender, and Method by Gender.

Method	Immediate post-test			Delayed post-test		
Gender	n	$\bar{x}$	S.D.	n	$\bar{x}$	S.D.
Hands-on	55	66.47	22.96	50	54.88	22.74
Worksheet	61	64.20	21.61	54	51.33	24.07
Male	76	61.16	22.01	71	48.84	23.08
Female	40	73.10	20.60	33	62.06	21.77
Hands-on						
Male	36	62.78	22.17	34	50.94	22.33
Female	19	73.47	23.37	16	63.25	21.97
Worksheet						
Male	40	59.70	22.05	37	46.92	23.88
Female	21	72.76	18.31	17	60.94	22.20

The data from the experiment (Ohm's Law) and the replication (incline plane) were analyzed using 2 x 2 factorial analysis of variance (ANOVA) procedures to determine if significant differences existed between the main effects of method of reinforcement (hands-on or worksheet), gender, or the interaction of the main effects. Results for the Ohm's Law anlayses for both the immediate post-test and the delayed post-test (Table 3) indicated that neither the main effect for method nor the interaction of method and gender were significant ($\rho \geq 0.10$). The analyses did reveal significant differences ($\rho \leq 0.10$) in both immediate and delayed post-test scores for the main effect of gender with females achieving higher scores than males (Table 3).

Table 3: Factorial ANOVA for Ohm's Law Achievement Tests

Source	Immediate post-test df	F	ρ	Delayed post-test df	F	ρ
Method	1,93	0.054	0.82	1,82	0.00	0.95
Gender	1,93	3.24	0.08	1,82	5.41	0.02
Method x Gender	1,93	0.13	0.72	1,82	0.25	0.62

The results (Table 4) of the analyses for the incline plane replication were consistent with the Ohm's Law experiment. Neither the main effect for method nor the interaction of method and genderwere significant ($\rho \geq 0.10$). Significant differences ($\rho \leq 0.10$) existed in both immediate and delayed post-test scores for the main effect of gender (Table 4).

Table 4: Factorial ANOVA for Incline Plane Achievement Tests

Source	Immediate post-test df	F	ρ	Delayed post-test df	F	ρ
Method	1,112	0.20	0.66	1,100	0.60	0.44
Gender	1,112	7.84	0.006	1,100	7.55	0.007
Method x Gender	1,112	0.08	0.78	1,100	0.03	0.86

Because no significant differences were found for the main effect of method of reinforcement, or the interaction of method and gender, the null hypotheses for both the Ohm's Law and the incline plane experiments were not rejected for either the immediate and delayed post-tests. However, since differences were found for the main effect of gender, the null hypotheses of no differences by gender were rejected.

Secondary analyses were preformed to rule out potential rival hypotheses involving interactions between method of reinforcement, gender and the classroom unit in which the individual subects were enrolled. Since no significant interaction effects were found ($\rho \geq 0.10$), it was concluded that these rival hypotheses did not confound the results of the study.

Conclusions, Discussion, and Recommendations

The results of this study were consistent across both the experiement and the replication. Hands-on and worksheet reinforcement methods were equally effective in producing learning and retention of subject matter. In addition, the method of reinforcement had no differential effects by gender. However, differences on both the immediate and delayed post-tests were noted for the main effect of gender, with females scoring higher than males. The reader should keep in mind that, because of subject selection methods used in this study, results are not generalizable to any larger population.

The results of no effects for method on cognitive achievement in science are consistent with science education literature, as summarized by Hoffstein and Lunetta (1982). Since professionals in agricultural education have historically noted that hands-on instruction is a unique strength of the program, additional reseach is warranted. This study should be replicated to determine if these results are stable across different subject matters, populations, teachers, and extended instructional periods in agricultural education.

The science education literature indicates that males have higher academic achievement than females in physical sciences, and that females benefit most by hands-on instruction in the physical sciences. However, the findings of this study of gender and reinforcement method conducted in agricultural education do not support the findings from the science education literature.

Further study is needed to clarify these findings, especially those which are inconsistent with research in science education. Females scored higher than males across subject matter and method of reinforcement, which is inconsistent with research findings among students of the larger school population. Thus, the question arises of

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whether gender differences among students in this study are representative of gender differences in agricultural education or in the larger student population. Does agricultural education attract female students of higher science abilities than the larger student population, or does it attract males of lower abilities? While this study cannot answer these questions, it does provide potential hypotheses for future investigations. Perhaps examination of data from national longitudinal studies could begin to provide answers to these questions.

This study focused on science-based subject matter in agriculture. As agricultural education moves toward a more science-based curriculum and away from a traditional production agriculture emphasis, will it appeal to students of higher science aptitudes?

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Method Of Reinforcement And Student Gender: Effect On Achievement In Agriscience Education

A Critique

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The authors are to be commended for a fine piece of research. I found the theoretical framework a real pleasure to read. Numerous and relevant research studies were cited with enough information to make a concise point or to support one. This appeared to be a tight research that used hypotheses testing, a posttest-only control group experimental design, a strong KR-21 coefficient, a 2 x 2 factorial analysis strategy, and a very good Conclusions, Discussion, and Recommendations section.

I recommend that all read this study report.

Practices, Perceptions, And Plans: A Description Of A Select Population Of Secondary Agricultural Educators

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Introduction and Theoretical Framework

Agricultural education is an increasingly complex and diverse field regulated primarily by state and local entities. Although national organizations might propose reforms, the degree to which those suggestions are implemented depends largely upon the perspective of state and local bodies. At times, the future of agricultural education in a given state or community may even depend upon non-agricultural or non-educational groups without a vested interest.

One case in point is the state of Maine, a state which lacks a full-time teacher educator and a state supervisor with an agricultural education background. Like many states, Maine suffered a decline in enrollment as the United States became more urban. Unlike most states, however, agricultural education did not adapt. In a state known for agricultural commodities including forestry, blueberries, potatoes, apples, dairy, and seafood, agricultural education nearly died in the late 1980s.

Maine's early agricultural education history closely parallels national agricultural education history. Maine was home to the Gardiner Lyceum, which opened in 1821 for the sole purpose of teaching agricultural concepts (Moore, 1987). A college focusing on agriculture and the mechanical arts was created in 1862 through the federal Morrill Act and has grown to become the University of Maine at Orono. As with much of the country, agricultural education in Maine during the second half of the nineteenth century and the early twentieth century was conducted at the post-secondary level (Maine Department of Education, 1866, 1876, 1886, 1896, 1906).

The federal Smith-Hughes Act of 1917 led to the creation not only of secondary agricultural education programs, but also an underlying philosophy. From the beginning, state supervisors, secondary teachers, teacher educators, and leaders in the agricultural industry were all recognized as integral parts of the agricultural education structure (Key & Price, 1987; Hillison, 1987).

As with other states, Maine created such a structure. During the 1920s, and into the 1940s, enrollment in agricultural education programs grew. This is illustrated both by Maine Department of Education records (1926, 1936) and by membership in the Maine Association of the National FFA Organization (Hinckle, 1995). After a sharp decline in enrollment during World War II, numbers again climbed. More than one thousand students were members of the FFA each year during the 1950s (Hinckle, 1995).

In the 1960s, however, the climate for agricultural education in Maine changed. Many factors combined to cause a loss of enrollment and program closures. Robert Rhoads (1996), former assistant dean of the university's college of agriculture, recalls the president and the governor meeting in the spring of 1963 and agreeing that agriculture was a dying industry in Maine. During that same year, the federal Vocational Educational Act of 1963 decreased the importance of specific vocational areas, allowing the creation of industrial education programs instead

(Key & Price, 1987). Shortly after the meeting at the university, the agricultural teacher educator, who was already an assistant state supervisor, became the state supervisor and the department of agricultural education at the university was closed. Soon after, the position of state supervisor was also abolished. By the end of the decade, then, Maine was without a support system for secondary agricultural education instructors, an environment which has essentially continued to the present day.

In 1988, the National Research Council released a landmark study, Understanding Agriculture: New Directions in Education. Among the recommendations were to alter the focus of agricultural education, update the content of current programs, create strong leadership at the state and national levels, make budgetary and programmatic policy changes, broaden agricultural subject matter, and revise and expand teacher education and in-service.

The committee broadly defined agriculture to include not just food, fiber, and natural resource systems, but all support industries involved in producing these commodities. In addition, the committee made specific recommendations regarding the roles of each interest group within agricultural education: the state department of education, university, industry, youth organization and secondary teachers (National Research Council, 1988).

Further impetus for national reform was presented by national agricultural education leaders in the Strategic Plan for Agricultural Education, outlining the resolutions and goals outlined by the leaders of the agricultural education constituent groups. The Strategic Plan was released in 1990 and revised in 1995. The current version focuses on six issues: the purpose, realignment of curriculum, identification of clienteles, supply of agriculture educators, and federal legislation (The National Council on Agricultural Education, 1995).

Tragically, the magnificent vision of agricultural education outlined by these documents may never come to fruition in Maine and other states which face similar voids in state structure. In fact, a study conducted by Fuller and Annis in 1992 found that New England land grant institutions needed to provide leadership to restructure agricultural education. The same study found that the leadership ability of the state department of education had been "seriously eroded."

This study was intended to be the first step in rebuilding agricultural education in Maine.

Purpose and Objectives

One key to successful remediation is an understanding of the current agricultural education environment. The purpose of this research was to create a benchmark profile of agricultural educators in Maine as of spring, 1996. Data to be collected included demographics, current practices, and perceptions about the interest groups. Specific objectives of the research were:

1. To determine and describe the demographics of this population.
2. To develop a working definition of agriculture.
3. To determine current practices regarding the role of: a) the university; b) the state department of education; and c) industry within agricultural education.
4. To measure perceptions about the appropriate role with secondary agricultural education for: a) the university; b) the state department of education; c) industry; and d) youth organizations.

Methods and Procedures

This study was designed as a descriptive census of the population. Three separate sampling frames were combined to create the largest possible population. Those frames included the national Agricultural Educators Directory (Henry, 1995), the Maine Department of Education Directory of Agriscience and Natural Resources Programs (1995), and the Maine Soil and Water Conservation Districts' list of schools participating in the 1995 Maine Envirothon. A total of 100 respondents was initially identified; ten were eliminated due to inaccuracies, program closures, or moving. This lead to a pool of 90 potential respondents, all of whom were included in the study.

The instrument was a researcher-designed questionnaire with four sections. Section one consisted of 18 questions about demographics with primarily categorical responses. Section two listed 17 terms included in the national definition of agriculture and asked respondents if they accepted each term as part of agriculture. Section three contained ten statements about current practices regarding interest groups. Section four consisted of 35 statements about specific areas of perception which were measured on a 5-point Likert-type scale with responses being strongly agree to strongly disagree. Content and face validity were established using agricultural teacher educators and educational researchers at Texas Tech University. The Cronbach's alpha reliability coefficient was 0.93.

The instrument was pre-tested with Texas agricultural educators in July, 1995. After revisions, the data collection process began March 11, 1996. The cut-off date was April 20. Strategies used to increase the response rate included an initial premium of a notepad, follow-up mailings of both postcards and additional instruments, and telephone calls. Although the initial intent of the calls was to compare respondents and non-respondents, the participants contacted volunteered to return the completed survey. The overall response rate was 88.89% (n=80). As this rate was greater than the 80% cited as acceptable by Borg and Gall (1989), the possibility that the nonrespondents could alter the results was deemed minimal and no effort was made to compare respondents and nonrespondents. Three additional surveys were returned after data analysis had begun and were not included in the results.

After initial review, nine surveys were declared unusable because the respondents were not directly involved in secondary agricultural education. Data from 71 surveys were analyzed using SPSS. Descriptive statistics such as measures of central tendency and frequency were used to achieve all objectives.

Findings

Objective 1

A very diverse population was identified through this research. A majority (66.2%, n=47) of the respondents were male. The mean age was 43.9 years with a standard deviation of 8.6 years. The mean level of teaching experience was 15.5 years with a standard deviation of 9.7. Responses were received throughout the state, demonstrating the geographic diversity of the population. The only areas not represented were unorganized territories.

Sixty-six respondents held a bachelor's degree; 23 respondents had earned master's degrees; and three respondents held terminal degrees.

One important characteristic of this population was the possibility of attrition. Twenty-eight respondents plan to leave teaching within the next ten years; another 18 are undecided. This means the state could lose 64.8% of the population within ten years.

Another factor of interest was the exposure to agriculture of the respondents. Six potential exposures were identified as listed in Table 1. The most common exposures were having relatives involved in agriculture or having worked in agriculture. Thirty-two percent of all respondents, however, had not been exposed to agriculture through any of the identified paths. Only one respondent had been exposed to agriculture through all six paths.

Table 1. Agricultural exposure of respondents (n=71)

Type of exposure	N	Percent
Has relatives who work in an agricultural enterprise	34	47.9
Worked within the agricultural industry	32	45.1
None of the options listed	23	32.4
Was raised on a farm/ranch	15	21.1
Participated in 4-H as a child	8	11.3
Participated in FFA as a child	8	11.3
Took agricultural courses in high school	8	11.3

Teachers were asked to indicate both primary and secondary teaching assignments. They could select only one primary assignment, but multiple secondary assignments. The most common primary assignment was biology (29.6%; n=21). Agriculture was listed as the primary assignment for six teachers (8.5%); forestry was the primary assignment for eight teachers (11.3%); and horticulture was the primary assignment for three (4.2%).

Ecology was the most common secondary teaching assignment (47.9%; n=34). Twenty-one (29.6%) teachers indicated forestry was a secondary assignment; 16 (22.5%) marked aquatics; 11 (15.5%) marked agriculture; and 10 (14.1%) marked horticulture.

The most common agricultural concept taught was ecology, taught by 50 (70.4%) of the teachers. A majority of teachers also taught water conservation (62.0%; n=44); soils (59.2%; n=42); and basic plant science and technology (52.1%; n=37). Only five (7.0%) respondents indicated they did not teach any of the agricultural concepts listed.

The final demographic evaluated the interaction of respondents with related agencies and organizations. The most common interaction was with the Cooperative Extension Service (71.8%; n=51). A majority of the teachers also interacted with the Maine Department of Inland Fisheries and the University of Maine at Orono. Slightly less than half (49.3%; n=35) had interacted with the department of education during the past year.

Objective 2

The second objective of this study was to create a working definition of agriculture. The 17 terms included in the definition of agriculture created by Understanding Agriculture: New Directions in Education were presented to participants. They were asked whether they would include each term in a definition of agriculture and could respond "YES," "NO," or "UND" (for undecided). One participant did not complete this section.

Each term was accepted as a part of agriculture by a majority of respondents. The topics receiving unanimous acceptance were food production and water conservation. The topics receiving the fewest affirmative responses were health and recreational resource management. Table 2 summarizes the responses in rank order based upon the affirmatives.

Table 2. Rank order listing of responses to terms presented for inclusion in a definition of agriculture

	Yes		No		Undecided		
Topic	N	%	N	%	N	%	n
Food production	70	100.0	0	0.0	0	0.0	70
Water conservation	70	100.0	0	0.0	0	0.0	70
Land conservation	69	98.6	0	0.0	1	1.4	70
Horticultural crops	68	97.1	1	1.4	1.	1.4	70
Fiber production	63	92.6	3	4.4	2	2.9	68
Farm service industries	59	85.5	2	2.9	8	11.6	69
Marketing	58	84.1	6	8.6	5	7.2	69
Farm production supply industries	58	84.1	1	1.4	10	14.5	69
Processing	57	82.6	5	7.2	7	10.1	69
Wood products	54	80.6	7	10.4	6	9.0	67
Food consumption	52	76.5	9	13.2	7	10.3	68
Financing	51	75.0	6	8.8	11	16.2	68
Nutrition	51	75.0	10	14.7	7	10.3	68
Product distribution	51	73.9	7	10.1	11	15.9	69
Recreational resource development	48	69.6	11	15.9	10	14.5	69
Recreational resource management	46	67.6	11	16.2	11	16.2	68
Health	45	65.2	11	15.9	13	18.8	69

Objective 3

The third objective of this study was to determine current practices of the respondents. The survey presented ten statements focusing on multiple aspects of agricultural education, including the involvement of various interest groups and the relative value of youth organizations. Participants were able to respond to each statement with yes, no or undecided.

A majority of participants responded in the affirmative to statements regarding the importance of agriculture in their community (81.7%; n=58), teaching agricultural concepts (81.4%; n=57), the importance of co-curricular activities (65.7%; n=46), and awareness of the FFA (52.1%; n=37). The fewest participants indicated regular interaction with the department of education (80.9%; n=55). A complete listing of the statements and their responses is included as Table 3.

Table 3. Rank order listing of statements regarding respondents' current practices in agricultural education

	Yes		No		Undecided		
Practice	N	%	N	%	N	%	n
I teach agriculture concepts in class.	57	81.4	6	8.6	7	10.0	70
Agriculture is important to my community.	58	81.7	8	11.3	5	7.0	71
Co-curricular activities play a vital role in agricultural education.	46	65.7	7	10.0	17	24.3	70
I am familiar with the FFA.	37	52.1	32	45.1	2	2.8	71
I seek input from agricultural professionals when evaluating agricultural curricula.	30	44.1	35	51.5	3	4.4	68
I regularly invite members of the agricultural community to speak to my students.	27	38.0	43	60.6	1	1.4	71
I receive instructional support from faculty members at the University of Maine.	21	30.4	44	63.8	4	5.8	69
I regularly use educational resources provided by the Department of Education.	21	30.4	45	65.2	3	4.3	69
I regularly interact with University of Maine-Orono faculty.	19	27.1	47	67.1	4	5.7	70
I regularly interact with staff in the Maine Department of Education.	8	11.8	55	80.9	5	7.4	68

Objective 4

The fourth objective of this research was to determine what participants perceived as appropriate roles for the interest groups of agricultural education. The fourth section of the survey contained 35 Likert type statements regarding different groups. The descriptive statistics reported for this section were based on the following scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree. None of the statements received a mean score lower than 3.15, which at worst indicates indecision.

Table 4 lists the rank order for each of the 35 statements as well as the range of responses. The statement receiving the highest mean (4.62) was the item "Agriculture is an important industry in Maine." The statement receiving the lowest mean (3.15) was "The state department of education should play a larger role in developing curriculum." The statement "Agricultural instructional materials are readily available to me" received only a 3.36.

In general, statements regarding the role of agriculture in the community and the role of youth organizations in agricultural education received positive responses. Relatively speaking, statements regarding the involvement of the department of education received the least favorable responses.

Table 4. Rank order listing of items describing respondents' perceptions towards the roles of agricultural education interest groups in Maine agricultural education

Perception	Mean[a]	SD	Range	N
Agriculture is an important industry in Maine.	4.62	.52	3 - 5	71
Agricultural education should be important to members of my community.	4.32	.75	1 - 5	71
Educators should teach citizenship.	4.30	.74	2 - 5	71
Educators should emphasize learning activities which promote cooperation.	4.30	.64	3 - 5	70
Educators should teach agricultural concepts in class.	4.27	.63	3 - 5	71
Extra-curricular activities directly related to classroom activities should be an integral part of education.	4.25	.71	2 - 5	71
Educators should teach leadership skills.	4.23	.72	2 - 5	71
Students should take advantage of youth organizations related to their coursework.	4.20	.58	3 - 5	71
All students should learn about agriculture.	4.13	.84	2 - 5	71
Industry leaders and educators should work together to develop agricultural instructional materials.	4.13	.57	3 - 5	69
Educators should interact with agricultural industry representatives.	4.13	.70	2 - 5	71
Agricultural educators should receive instructional support from faculty members at the University of Maine - Orono.	4.11	.64	2 - 5	71
Staff members at the department of education should provide resources to support lessons.	4.08	.81	1 - 5	71
Educators should encourage students to become involved in pre-professional organizations.	4.06	.67	3 - 5	71
The University of Maine should produce agricultural instructional materials.	4.06	.63	3 - 5	70
Agricultural professionals should have input when educators are evaluating agricultural curricula.	4.00	.72	2 - 5	71
Agricultural industry leaders should become more involved in agricultural education.	3.99	.69	2 - 5	70
More in-service training about agricultural education should be provided by the university.	3.97	.77	2 - 5	71
Educators and University of Maine - Orono faculty should regularly interact.	3.96	.76	2 - 5	71
Agricultural professionals should have a role in determining agricultural course content.	3.90	.90	1 - 5	71
The state department of education should provide information about agriculture.	3.90	.76	1 - 5	71
Educators and staff in the Maine Department of Education (MDE) should regularly interact.	3.84	.86	1 - 5	70
Agricultural information should be easier to obtain from the University of Maine - Orono.	3.72	.82	2 - 5	69
Agricultural education should be important to all educators.	3.69	.98	2 - 5	71
The state department of education should place additional emphasis on agricultural education.	3.64	.82	1 - 5	70
More in-service training about agriculture should be provided by the department of education.	3.63	.92	1 - 5	70
Members of agricultural professions should frequently speak to my classes.	3.56	.91	1 - 5	71

[a] 1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree

Table 4. Continued

Perception	Mean*	SD	Range	N
The state department of education should receive additional funding to promote agricultural education.	3.52	.87	1 - 5	69
If I were convinced of its value, I would sponsor another co-curricular activity.	3.46	.98	1 - 5	69
The University of Maine - Orono should play a larger role in developing curriculum.	3.45	.86	1 - 5	71
Agricultural corporations should develop educational curricula.	3.44	.95	1 - 5	71
My school district should focus more attention on agricultural education.	3.41	.89	2 - 5	71
The University of Maine - Orono should place additional emphasis on preparing all teachers for agricultural education.	3.39	.91	2 - 5	70
Agricultural instructional materials are readily available to me.	3.36	.97	1 - 5	69
The state department of education should play a larger role in developing curriculum.	3.15	.97	1 - 5	71

* 1= Strongly Disagree; 2= Disagree; 3= Undecided; 4= Agree; 5= Strongly Agree

Conclusions, Recommendations and Implications

It was concluded that a large, albeit non-traditional, population of agricultural educators exists throughout the state of Maine. These individuals come from a wide variety of backgrounds and are teaching agricultural concepts in many classes not previously recognized as fitting the agricultural education structure. These teachers do share a common definition of agriculture, the knowledge that agriculture is a vital industry within the state, and a belief in the value of co-curricular activities. Although several respondents indicated they are overworked, many would consider sponsoring an additional co-curricular activity. Efforts should be made to provide additional information and increase understanding of agricultural education and its related student organization, the FFA.

In addition, the respondents had difficulty locating agricultural instructional materials. Efforts must be made to increase their awareness of and access to these materials. The state department of education should take responsibility for compiling and maintaining information regarding sources of instructional materials, guest speakers, and other agricultural information.

Inclusion and acceptance of these teachers is key to rebuilding agricultural education in Maine, as is creation and maintenance of a strong state structure. Leaders within the state departments of education and agriculture, the land-grant university, the agricultural industry and the teachers' organization must work together to strengthen the cause. This structure must be capable of recruiting or preparing new teachers and supporting teachers who move into agriculture from other subject areas as well as providing support for current teachers. The land-grant university should provide agricultural teacher education as part of its teaching mission.

It was further concluded that one major contributing factor to the current state of affairs is a lack of leadership by any organization at the state level. As the status quo is ineffective, state leaders should consider hiring outside consultants to conduct an external review to evaluate the current system and create a proposal for restructuring.

Further in-service and pre-service education should be conducted to increase the understanding of the broad scope of agriculture. This education should be provided not only to agricultural educators, but also to those entering other areas of education. Agricultural literacy continues to be a need for which most educators are not prepared. Although a majority of the respondents accepted the national definition of agriculture, substantial disagreement still exists. Efforts must be made to resolve those disagreements through education.

One tool the state should use in its fight to promote agricultural education is the FFA. These students are articulate spokespeople who clearly demonstrate the value of agricultural education. Strong efforts should be made to promote the FFA and agricultural education at public events throughout the state. The state department of education should assume responsibility for coordinating the training and appearances of FFA members.

Ultimately, the future of agricultural education and (by extension) agriculture in the state of Maine depend upon the strategies adopted by state leaders within the next few years. Agricultural education is at a critical point: if state leaders make a concerted effort to build agricultural education, it has virtually unlimited potential; if state leaders allow the status quo to continue, agricultural education will face extinction.

Although this study was limited to Maine and the conclusions and recommendations are similarly limited, it is important to note one major implication of this study. Although no cause and effect relationship has been established, the lack of state structure clearly played a role in the declining fortunes of agricultural education. States which are in the process of reviewing their state structure, revising their state leadership and implementing drastic downsizing measures would do well to consider Maine's fate. Truly, strong state leadership is vital to the continuing success of agricultural education!

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Practice, Perceptions, And Plans: A Description Of A Select Population Of Secondary Agricultural Educators

A Critique

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This study is not what I am accustomed to reading in agricultural education research. Because of this difference, it was quite relaxing to read. The authors are to be commended in their effort to establish a benchmark profile of agricultural education in Maine. This study was an effort to get a baseline foundation from which to build in the future with an understanding of the past. The authors went a long way in accomplishing this task.

Much effort went into developing an instrument that generated a strong alpha coefficient (Alpha=.93) and the data were collected through response categories that were easy for respondents to record their feeling. However, an instrument with 35 statements is quite a lot to expect respondents to complete. It was interesting to note, however, that 89% returned the questionnaires out of a population of 90.

As I read through this study report, I did not get a good feel for similar research completed in other states with similar concerns. After reviewing the reference list, very few research studies were cited. Consequently, the theoretical framework appeared to be more of a historical perspective and did not establish the research base for the study. So my question is: Was a thorough search of the research literature conducted? Did the researchers contact other states to get a better grasp of the problem?

Moreover, the information presented in Table 4 of the study could be more digestible if similar items were grouped. For example, items that dealt with curriculum material could be grouped together, items that involved University of Maine faculty and the Department of Education could be grouped together, and there are other natural groupings that could have been accomplished. In describing the demographic data, I was concerned that the researchers stated that "This means the state could lose 64.8% of the population within ten years." Then it occurred to me that "64.8% of the agricultural teaching population" could be lost. So, some care should be taken in interpreting data and findings more accurately.

In conclusion, I am very uncomfortable with the Conclusions, Recommendations, and Implication section of this study. From my perspective, conclusions and recommendations are not based upon the data collected. For example, the statement "As the status quo is ineffective, state leaders should" did not seem to be based upon data presented in the study report. Frankly, I could not find statements that evaluated the effectiveness of the state leaders. Neither could I find data relative to "agricultural literacy" nor data that referred to "promote FFA." This section appears to include leaps and bounds beyond the data.

The Status Of Integration Of Academic And Agricultural Education In North Carolina

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Introduction/Theoretical Framework

The Southern Regional Education Board (SREB) initiated the 'High Schools That Work' program in 1987 in an effort to improve the education career-bound students were receiving. One of the key practices of the initiative was the integration of vocational and academic curricula (Miller, 1997). The program now includes more than 650 high schools in 21 states, all of which are integrating vocational and academic curriculum at some level (Miller, 1997). Examples of successful integration of agricultural and academic education include a 'Principles of Technology' course in Oklahoma that was designed to be a physics course for agriculture (Bottoms, Presson, and Johnson, 1992) and state-wide curriculum changes in Tennessee that resulted in a course which combined biology, chemistry, and physics with agriculture (Bottoms, Presson, and Johnson, 1992). Other examples of vocational/ academic integrated curricula in agriculture included the Science and Agriculture Curriculum Project formed in 1990 in California (Emery and Linder, 1993), the Agriscience and Natural Resources Education curriculum in Michigan (Elliot, Connors, and Steeby, 1991), the Biological Science Applications in Agriculture curriculum in Illinois (Osborne and Moss, 1991), and the Research Methods in Agriculture curriculum in North Carolina (Clayton, Clayton, and Newman, 1993).

Vocational and academic integration has been supported by both the teaching profession and business and industry. The concept of vocational and academic integration has been endorsed by the Office of Education since the mid 1930's (Moss, 1990). Gable and Ransdell (1993) stated that the concept of vocational and academic integration is supported by educators, business and industry, and government policy makers. Pritz and Davis (1990) emphasized the equal importance of both academic and vocational skills. They identified both types of skills as being essential in the workplace so workers would be flexible enough to solve problems and keep up with new technology. Capelli (1990) also stated that both academic and vocational skills were important for students' success in the job market. According to Tremaine (1992), vocational and academic curriculum must integrate in order to meet students' educational needs and make education more meaningful and relevant.

The Southern Regional Education Board created a vocational and academic integration model which outlined nine practices to follow in curriculum integration (Bottoms, Presson, and Johnson, 1992). These practices included revising vocational and academic curricula, amending student high school graduation requirements, and providing help for both teachers and students with the curriculum integration. Although the Carl D. Perkins Vocational and Applied Technology Act of 1990 listed as a priority the integration of vocational and academic curricula, the act did not list specific ways to achieve such integration (Stecher, Hanser, Hallmark, Rahn, Levesque, Hoachlander, Emanuel, and Klein, 1994). An obvious way to integrate academics and vocational curricula was to include more academic content in vocational curricula. Vocational and academic integration was also accomplished through team-teaching, which involved a vocational teacher and an academic teacher teaching an integrated curriculum together (Bottoms, Presson, and Johnson, 1992; Freeman, 1992; Grosvenor and Thode, 1986; Martinez and Badeaux, 1992, 1994; Olds and Lightner, 1995; Osborne and Moss, 1991; Selfridge and Stillwagen, 1992; Smith and Hausafus, 1993; Whent, 1992).

A major student benefit of vocational and academic integration is that vocational and academic integration enables students to be better prepared for the job market (Capelli, 1990; Ellington and Henson, 1986; Oswald, 1986; Pritz and Davis, 1990; Steinauer, 1986). According to Tremaine (1992), problem-solving skills, cooperative learning and teamwork, and job-seeking skills are strongly encouraged in the vocational and academic integrated curriculum. Another benefit of vocational and academic integration is that students learned abstract academic concepts through concrete, real life examples (Parkhurst, 1986; Pritz and Davis, 1990; Rankin, 1993). Steinauer (1986) stated that vocational and academic integration changes student's opinions about the relevance of academic skills to real-life situations. According to Oswald (1986), students' academic skills are strengthened by vocational and academic integration because more higher-level academic skills are included in vocational and academic integrated curricula than in a traditional vocational curriculum. Several authors reported improved student performance on vocational and academic material as a result of vocational and academic integration (Keeley, 1990; Martinez and Badeaux, 1992, 1994; Olds and Lightner, 1995; Newman and Johnson, 1993; Smith, 1986). In addition, students mastered both vocational and academic competencies at the same time, thus creating a more efficient education (Oswald, 1986; Parkhurst, 1986). The Southern Regional Education Board reported increased student achievement on national assessment tests as a result of vocational and academic integration (Miller, 1997). Schools with integrated programs also "report that dropout rates have decreased as motivation, test scores, grades, and self-esteem have increased" (Keeley, 1990, p. 28).

Teachers also benefit from vocational and academic integration. One major teacher benefit is that teachers from two different backgrounds become familiar with each other's work and, as a result, form mutual respect for each other (Bottoms, Presson, and Johnson, 1992; Parkhurst, 1986; Pritz and Davis, 1990). According to Pritz and Davis (1990) and Bottoms, Presson, and Johnson (1992), vocational and academic integration also provided teachers with more material to use for lessons, thus allowing teachers to be more creative. Perhaps the greatest teacher benefit of vocational and academic integration is that teachers learned to cooperate with each other (Bottoms, Presson, and Johnson, 1992; Grosvenor and Thode, 1986; Rankin, 1993; Tremaine, 1992). According to Parkhurst (1986), teachers working in vocational and academic integrated programs gained a better understanding of the educational goals that all teachers share.

Despite the many teacher and student benefits of vocational and academic integration, there are several barriers which hinder the progress of vocational and academic integration. Teachers require more time to develop new curriculum, plan activities, research curriculum integration methods, and work with other staff members on vocational and academic integration (Kentta, 1993). Another major barrier of vocational and academic integration is lack of funding (Grosvenor and Thode, 1986; Pritz and Davis, 1990; Ramsey, 1995). Yet another concern is that the connection between vocational and academic curricula was not made by students (Bottoms, 1992; Pritz and Davis, 1990). Other barriers reported by authors are the reluctance of teachers to change and the lack of commitment to the program (Pritz and Davis, 1990). Miller (1997) reported some teachers do not believe that curriculum integration will help the career-bound students, the primary target for the integrated curriculum. Bottoms, Presson, and Johnson (1992) listed several additional concerns towards vocational and academic integration; included are administrative support, staff development, and program flexibility. Ramsey (1995) also identified student graduation requirements, performance-based assessments, and college admission requirements as barriers of vocational and academic integration.

Purpose and Objectives

The primary purpose of this study was to determine the current level of vocational and academic integration achieved in North Carolina secondary public school agricultural departments. A secondary purpose was to compare the opinions of agricultural teachers who did and did not receive Southern Regional Education Board grant monies towards vocational and academic integration. Specifically, the following research questions provided a focus for the study:

1. What methods are used to accomplish vocational and academic integration in North Carolina secondary agricultural departments?
2. What are the teacher benefits of vocational and academic integration as perceived by agricultural teachers?
3. What are the student benefits of vocational and academic integration as perceived by agricultural teachers?
4. What are the barriers of vocational and academic integration as perceived by agricultural teachers?
5. Are agricultural teachers who received Southern Regional Education Board grants for vocational and academic integration more in favor of vocational and academic integration than agricultural teachers who did not receive the grants?

Methodology

This study was descriptive explanatory in nature. Survey research methods were used to collect the data. Data related to the research questions were collected from two populations. The first population consisted of all North Carolina secondary public school agricultural teachers who received Southern Regional Education Board grant monies for vocational and academic integration (N= 32). A current list of North Carolina public secondary schools which received Southern Regional Education Board grant monies for vocational and academic integration was obtained from the North Carolina State Department of Public Instruction. From this list all schools which had agricultural education programs were selected. The agricultural teachers at these schools were identified using the 1996 North Carolina Agricultural Education Directory. All 32 teachers identified were surveyed. The second population consisted of all remaining North Carolina secondary public school agricultural teachers who did not receive Southern Regional Education Board (SREB) grant monies for vocational and academic education (N= 281). All schools with an agricultural education program minus those schools which received SREB grant monies were listed according to state region and agricultural education program size. In each of these regions two lists were made, one for schools with one agricultural education teacher and one for schools with two agricultural education teachers. Schools with three agricultural education teachers (N=9) were not included, since no school with three agricultural teachers received SREB grants.

Schools with one- and two- teacher agricultural education programs were selected from each region using a table of random numbers. The number of schools selected from each region was determined by the number of schools with agricultural departments in each region that received Southern Regional Education Board grants. A total of 23 schools employing 32 agricultural teachers was selected to be the sample for the population of North Carolina public secondary school agricultural teachers who had not received SREB grant monies for vocational and academic integration.

Based upon a review of the literature an instrument was developed by the researcher to collect data for this study. Some items included in the instrument were adapted from studies conducted by Hartzell (1995), Johnson (1996a & b), Schell and Wicklein (1993), Dormody (1993), and Newman and Johnson (1993). Additional items were developed to address further the research questions of this study. The instrument contained sections that provided for collection of data related to methods used in integrating vocational and academic education, student and teacher benefits from integration of vocational and academic education, barriers to implementation, and teacher attitudes toward integration of vocational and academic education. Finally, agricultural teachers were asked to estimate the level of vocational and academic curriculum integration achieved at their school using a scale which ranged from 0-100 %. Content validity was established by a panel of experts from the Department of Agricultural and Extension Education at North Carolina State University, the North Carolina State Department of Public Instruction, and the College of Education and Psychology at North Carolina State University. Twenty teachers were randomly selected for a pilot study from the remaining North Carolina secondary agricultural teachers not used in either sample. Internal consistency, as a measure of the reliability of the attitude scale, was established using Cronbach's Alpha ($\alpha = .94$).

Sixty-four North Carolina public secondary school agricultural teachers were mailed questionnaires with an appropriate cover letter and a self-addressed stamped envelope. This mailing resulted in 36 (56.2%) responses. A follow-up letter was mailed two weeks later to those teachers who had not yet responded. The second mailing resulted in an additional 13 (20.3%) responses. Nonresponse error was controlled by comparing early and late respondents on the mean attitude scores (Miller and Smith, 1983). A t-test was used to examine each group, and the t-values showed the attitude means were not statistically significant (Borg and Gall, 1989).

Data were summarized using measures of central tendency, variance, and frequencies and percentages. The differences between the two groups, agricultural teachers who did and did not receive Southern Regional Education Board grant monies for vocational and academic integration, on research questions number 1 through 5 were measured using a t-test (Glass and Stanley, 1970). Alpha levels were set at .05 a priori.

Results

To determine which methods of vocational and academic integration were most used by teachers, several methods of vocational and academic integration were listed. Respondents were asked to indicate their use of the listed vocational and academic integration methods using a four point Likert-type scale with the following choices: 1 = never used; 2 = used very little; 3 = used sometimes; 4 = used many times. Table 1 contains a complete listing of curriculum integration methods presented in the questionnaire and the mean scores of responses by agricultural teachers who did and did not receive SREB grant monies for vocational and academic integration.

The methods of vocational and academic integration used most by both groups of teachers were those methods which dealt with increasing the level of academic content in agricultural classes. Both groups of teachers used the model 'increasing the amount of science in agricultural classes' more than any other model of vocational and academic integration; 100% of SREB teachers and 91% of non-SREB teachers identified this method of vocational and academic integration as being 'used sometimes' or 'used many times'. Ninety-six percent of SREB teachers and 78% of non-SREB teachers identified 'increasing the amount of math in agricultural classes' as a curriculum integration method that was 'used sometimes' or 'used many times'. 'Increasing the amount of reading and writing activities in agricultural classes' was identified by 88% of SREB teachers and 87% of non-SREB teachers as a curriculum integration method that was often used to integrate vocational and academic education. In addition, 'using or developing curriculum materials that include more academic content within existing agricultural classes' was identified by 79% of SREB teachers and 91% of non-SREB teachers as a method of vocational and academic integration that was 'used sometimes' or 'used many times'. The method of vocational and academic integration least used by both groups was 'shared planning and teaching with an academic teacher'. Seventy-six percent of SREB teachers and 78% of non-SREB teachers identified this method as one which was 'used very little' or 'never used'. The mean score of both groups of teachers for this item was below the 'used very little' level.

To determine which teacher benefits of vocational and academic integration were considered most important by respondents, the instrument listed possible teacher benefits of vocational and academic curriculum integration. Respondents were asked to rank the benefits according to importance. The choices of the ranking scale were as follows: 1 = not important; 2 = slightly important; 3 = moderately important; 4 = very important. Table 2 contains a complete list of mean scores and standard deviations of all respondents for the teacher benefits listed in the questionnaire.

The ranking of the teacher benefits by teachers at schools which received SREB grants for vocational and academic integration and teachers at schools which did not receive SREB grants for vocational and academic integration was almost identical. Both SREB teachers and non-SREB teachers identified 'has instructional relevance' as the most important teacher benefit of vocational and academic integration. More staff communication was found as a 'moderately important' teacher benefit of vocational and academic integration. According to both groups of teachers, 'has more curriculum flexibility' was the least important teacher benefit of vocational and academic integration. However, this benefit was considered 'moderately important' or 'very important' by 62% of SREB teachers and 52% of non-SREB teachers.

Table 1
Means and Standard Deviations for Items Relating to Methods of Vocational and Academic Curriculum Integration

Integration Technique	SREB Teachers M	SREB Teachers SD	Non-SREB Teachers M	Non-SREB Teachers SD
Increasing the amount if science in agricultural classes	3.48	0.51	3.61	0.58
Increasing the amount of math in agricultural classes	3.36	0.57	3.22	0.83
Increasing the amount of reading and writing activities in agricultural classes	3.25	0.68	3.30	0.73
Using or developing curriculum materials that include more academic content within existing agricultural classes	3.08	0.72	3.32	0.60
Using experimental methods in developing learning activities for students	2.88	0.67	2.65	0.80
Team-teaching with an academic teacher	2.44	0.77	2.04	0.95
Reorganizing curriculum and coordinating with academic teachers so that similar topics are taught concurrently	2.32	0.69	1.74	0.89
Connecting one main topic or theme to all subject areas	2.08	0.91	2.26	1.11
Coordinating with academic teachers to teach higher-level thinking skills at the same time	2.08	0.93	1.70	0.86
Shared planning and teaching with an academic teacher	1.88	0.78	1.70	0.91

Note: 1= never used, 2= used very little, 3= used sometimes, and 4= used many times

Table 2
Mean Scores and Standard Deviations for Teacher Benefits of Vocational and Academic Integration

Teacher Benefits	SREB Teachers M	SREB Teachers SD	Non-SREB Teachers M	Non-SREB Teachers SD
Has instructional relevance	3.24	0.70	3.36	0.88
Has more staff communication	3.14	0.85	3.30	0.91
Has more resources	2.90	1.00	3.30	0.86
Stays refreshed on academic skills	2.86	1.06	3.26	1.01
Has more curriculum flexibility	2.71	1.01	2.74	1.03

Note: 1= not important, 2= slightly important, 3= moderately important, and 4= very important when referring to the mean scores.

To determine what agricultural teachers perceived as the most important student benefits of vocational and academic integration, the instrument listed possible student benefits of vocational and academic integration. Respondents were asked to rank each benefit according to importance using the following scale: 1 = not important; 2 = slightly important; 3 = moderately important; 4 = very important. Table 3 lists mean scores and standard deviations for all student benefits listed in the questionnaire.

For non-SREB teachers, all student benefits earned mean scores above the 'moderately important' level. Teachers from SREB schools also rated all student benefits above the 'important' level except the 'retains more information' benefit, which received a mean score slightly below the 'moderately important' level from SREB teachers. Teachers at SREB schools identified 'becomes better prepared for workforce' as the most important student benefit of vocational and academic integration. For teachers at non-SREB schools, 'becomes better prepared for workforce' and 'develops thinking skills' were both identified as the most important student benefits of vocational and academic integration. In addition, 92% of SREB teachers and 96% of non-SREB teachers identified 'develops problem-solving skills' as a 'moderately important' or 'very important' student benefit . While the ranking of the student benefits differed somewhat between the two teacher groups, the high mean scores indicate that both groups considered the student benefits of vocational and academic integration to be important.

To determine what agricultural teachers considered to be barriers of vocational and academic integration, possible barriers of vocational and academic integration were listed. Respondents were asked to rank the barriers according to the following scale: 1 = not important; 2 = slightly important; 3 = moderately important; 4 = very important. Table 4 contains a complete list of mean scores and standard deviations for the barriers listed in the questionnaire.

Table 3
Mean Scores and Standard Deviations for Student Benefits of Vocational and Academic Integration

	SREB Teachers		Non-SREB Teachers	
Student Benefit	M	SD	M	SD
Becomes better prepared for workforce	3.54	0.66	3.65	0.80
Develops problem-solving skills	3.46	0.66	3.61	0.74
Receives meaningful instruction	3.46	0.66	3.52	0.75
Gains more appreciation for agriculture	3.38	0.58	3.35	0.91
Develops thinking skills	3.38	0.65	3.65	0.73
Gets reinforcement of basic skills	3.33	0.56	3.39	0.92
Becomes well-rounded person	3.25	0.61	3.39	0.98
Gains more appreciation for academics	3.21	0.66	3.26	0.85
Retains more information	2.88	0.80	3.30	1.01

Note: 1= not important, 2= slightly important, 3= moderately important, and 4= very important.

The ranking of barriers of vocational and academic integration by both teachers at SREB schools and teachers at non-SREB schools was similar in many instances. According to both groups of teachers, the largest barrier of vocational and academic integration was 'time'. This barrier was rated 'moderately important' to 'important' by 95% of SREB teachers and 81% of non-SREB teachers. Eighty-one percent of SREB teachers and 71% of non-SREB teachers rated 'lack of faculty support' as a 'moderately important' or 'very important' barrier of vocational and academic integration. For the 'lack of funding' barrier, 86% of SREB teachers and 70% of non-SREB teachers had rating scores of 'moderately important' to 'very important'. Seventy-one percent of SREB teachers and 83% of non-SREB teachers identified 'lack of equipment/supplies' as a moderately important to very important barrier of vocational and academic integration. 'Planning' was identified by 81% of SREB teachers and 70% of non-SREB teachers as being a moderately important to very important barrier of vocational and academic integration. The least important barrier of vocational and academic integration according to both groups of teachers was 'evaluation'; 42% of SREB teachers and 54% of non-SREB teachers identified evaluation as a moderately important to very important barrier of vocational and academic integration.

To determine the attitudes of agricultural teachers towards vocational and academic integration and whether or not teachers from SREB schools were more in favor of vocational and academic integration than teachers from non-SREB schools, section 2 of the questionnaire contained 25 attitude statements concerning vocational and academic integration. Teachers were asked to respond to each statement using the following four-point attitude scale: 1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree.
Negatively stated items were reverse coded for data analysis. Due to space constraints, all 25 items will not be displayed in this paper, but some items merit discussion.

Table 4
Mean Scores and Standard Deviations for Barriers of Vocational and Academic Integration

	SREB Teachers		Non-SREB Teachers	
Barrier	M	SD	M	SD
Time	3.65	0.59	3.48	1.02
Lack of funding	3.28	0.85	3.13	1.16
Lack of faculty support	3.24	0.77	3.00	0.97
Lack of equipment/ supplies	3.19	0.87	3.43	0.93
Planning	3.14	1.06	3.04	1.05
Lack of space	2.95	1.07	3.04	1.16
Lack of instructional materials	2.90	0.94	3.14	1.09
Curriculum development	2.86	0.85	3.00	0.77
Lack of parental support	2.71	0.96	2.87	1.22
Staff development/ training	2.67	1.06	2.91	0.79
Lack of administrative support	2.57	1.08	2.96	1.09
Evaluation	2.55	0.94	2.61	0.91

Note: 1= not important, 2= slightly important, 3= moderately important, and 4= very important.

A mean attitude score was calculated for each group of teachers to determine if the attitudes of each group towards vocational and academic integration differed. The mean attitude score for agricultural teachers from schools which received SREB grants for vocational and academic integration was 2.68 (SD = 0.21). The mean attitude score for agricultural teachers from schools which did not receive SREB grants for vocational and academic integration was 2.69 (SD = 0.28). A t-test was calculated to determine if the difference in mean scores between the two groups of teachers was significant. The resulting t-value 0.90 was not statistically significant, indicating there was no difference between the two groups of teachers on attitudes towards vocational and academic integration.

Teachers from schools which received SREB grants for vocational and academic integration most strongly agreed with the statement 'vocational and academic integration enhances my agricultural program's image' (M= 3.16). Ninety-six percent of these teachers 'agreed' or 'strongly agreed' with this statement. For the same statement, agricultural teachers from schools which did not receive SREB grants had a mean score of 3.09; 74% of these teachers indicated that they 'agreed' or 'strongly agreed' with this statement. Teachers from both groups also agreed with the statement 'vocational and academic integrated curricula is challenging to average-ability students'. Ninety-two percent of the teachers from SREB schools and 91 % of the teachers from non-SREB schools agreed or strongly agreed with this statement. Another attitude statement that both teacher groups agreed with was 'vocational and academic integration better prepares students for employment'.

Both teachers from SREB schools and teachers from non-SREB schools disagreed with many of the same attitude statements. Both groups disagreed with the statement 'student class participation has increased due to vocational and academic integration'. Teachers from both groups also disagreed with the statement 'I have adequate equipment and supplies in my department for teaching vocational and academic integrated curricula'. Also, both groups of teachers indicated that they disagreed or strongly disagreed with the statement 'student enrollment has increased due to vocational and academic integration'.

Conclusions and Recommendations

Based on the findings of this study, the following conclusions were drawn:

Agricultural teachers in North Carolina are using a variety of methods to integrate vocational and academic curriculum in their programs. Infusion of academic content into the existing vocational curriculum is the predominant method of achieving vocational and academic integration. Agricultural teachers perceive that there are benefits of vocational and academic integration. Several teacher benefits from vocational and academic integration were considered important by North Carolina public secondary school agricultural teachers. 'Has instructional relevance' was considered the most important teacher benefit from vocational and academic integration by North Carolina public secondary school agricultural teachers. Agricultural teachers also perceive that students benefit from integration of vocational and academic education. The most significant student benefits from vocational and academic integration according to agricultural teachers were those which dealt with workforce preparation of and higher-level skill development by students. However, they are not as convinced that students retain more information as a result of this approach. Agricultural teachers feel that there are significant barriers to vocational and academic integration. A majority of the most important barriers dealt with time, and administrative and financial support of this initiative. Receiving a grant for vocational and academic integration does not affect teacher attitudes towards vocational and academic integration or the level of vocational and academic integration achieved. North Carolina secondary public school agricultural teachers are not strongly in favor of vocational and academic integration. The lack of strong teacher support of this educational reform may be related to the many barriers teachers encounter when attempting to integrate vocational and academic curricula.

Based on the findings, conclusions, and discussion of the study, the following recommendations are offered:

North Carolina secondary public school agricultural teachers should be allotted more time to implement vocational and academic integration. This may require additional planning time or a reduction in other expectations related to non-instructional assignments. School administrators must communicate support for integration of vocational and academic education in tangible ways, including funding for programs, equipment, and supplies. The State Department of Public Instruction and the State Agricultural Education staff should continue to provide guidance on improving the implementation of vocational and academic integration. The expectation for the level of integration of vocational and academic teachers should be clearly communicated to teachers. Teacher workshops should be focused on training teachers to use specific models of vocational and academic integration and reducing time requirements of vocational and academic integration. A study should be conducted to determine which model(s) of vocational and academic integration result in the highest student achievement gains. Results of that study would be used to determine which methods of vocational and academic integration should be emphasized at teacher training workshops.

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The Status Of Integration Of Academic And Agricultural Education In North Carolina

A Critique

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As I review this piece of research, I commend the researchers for a study that contributes to the further development of agri-science education in agriculture at the secondary school level. I was extremely impressed with the theoretical framework of the study and I got a strong feeling about what had been accomplished in the area of this research study. It was interesting to note that academic integration in agricultural education is alive and strong in North Carolina.

Since this was a study involving contract awardees (those receiving Southern Regional Education Board (SREB) grants) working to update programs and non-awardees, generalizability to the population of teachers outside of these parameters would not be appropriate. (I was confused as to the rational and selection of the comparison group.) Nor were there any attempt made to generalize beyond this population was attempted. The objectives, five in total, were clear, achievable, and well stated. However, I was surprised to see that only 56.2% of the teachers responded to this strong questionnaire (Alpha= .94). The researchers used t-test to compare respondents and non-respondents and found no statistical differences. Consequently, the authors used those learned research and statistical tools to appropriately tighten up the study. However, as I reviewed the four table, I wonder how many of SREB awardees and non-awardees responded to each statement. The total number of respondents were missing from all tables.

After all was said and done, I must ask the question as to how instruction has changed-- What effect has academic integration had on learning? or What kind of bang are we getting from our bucks? The researchers also thought about these concerns by stating that "which model(s) of vocational and academic integration result in the highest student achievement gain." Obviously, further research is warranted in this area.

Concurrent Session H

Theme:
Computer Technology

Field-Independent and Field-Dependent Undergraduate Agriculture Students' Computer Anxiety and Their Attitudes Toward Computers
Matt R. Raven, Mississippi State University
Michael E. Newman, Mississippi State Univ.
Tina M. Day, Mississippi State University

Chairperson:
James Key
Oklahoma State University

The Perceptions and Attitudes of Northwest Agriculture Instructors Towards the Use of Computers in Agricultural Education Programs
Gregory J. Nordheim
Mary Knight HS, Elma WA
James J. Connors, University of Idaho

Discussant:
Steven R. Harbstreit
Kansas State University

The Relationship Between Students' Learning Styles and Their Achievement in a Computer Applications in Agriculture Course
Michael E. Newman, Mississippi State Univ.
Matt R. Raven, Mississippi State University
Tina M. Day, Mississippi State University

Facilitator:
Matt Baker
University of Florida

Field-Independent And Field-Dependent Undergraduate Agriculture Students' Computer Anxiety And Their Attitudes Toward Computers

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Introduction

The future is difficult to predict; however, it is readily evident that the constant advances in computer technologies will continue to profoundly impact society. The time is quickly approaching where one's ability to utilize computers will be prerequisite for common day-to-day activities. Ely (1995) indicated that there is no doubt that people live in an information age and that computer technology is a symbol of progress. Each day brings new products, software, hardware, and opportunities to connect with information resources and people. The growth of computer technology is inevitable. People have learned to expect new developments, products, and experiences (Chou, 1997).

Chou (1997) commented that the computer age connotes a number of new positive and negative attitudes related to computer usage. Many feel that computers will enable people to achieve faster and more efficient performances. However, for many today, depersonalization, loss of privacy and fear are associated with the growing use of computers (Meier, 1988; Nickell & Pinto, 1986). Whether adults at work or children in our schools, there seems to be a substantial range of attitudinal reactions to the increasing usage of computers throughout society (Birkenholz, 1992; Nickell & Pinto, 1986).

Theoretical Framework

Computer Anxiety

McInerney, McInerney, and Sinclair (1994) indicated that among the literature on individuals who have negative affective reactions to computers, one finds a variety of terms applied which include computer aversion, computer resistance, computerphobia, and computer anxiety. While computer anxiety is the most commonly used, computerphobia is mentioned synonymously in many studies. McInerney, et al. (1994) further indicated that these terms are typically undefined, presumably with the assumption that computer anxiety is self-explanatory. McInerney, et al. (1994) defined that computer anxiety as an affective response of apprehension or fear of computer technology accompanied by feelings of nervousness, intimidation, and hostility. Negative attitudes toward computers may accompany such feelings of anxiety and include worries about embarrassment, looking foolish, and damaging equipment.

Loyd and Gressard (1984) suggested that a major factor in computer anxiety is lack of familiarity with computers, and that anxiety should decrease with increased experience. More recent research has corroborated this hypothesis (Crable, Scherer, & Jones, 1994). In contrast, Weil, Rosen, and Sears (1987) argued that during repeated exposure to the computer, the computer-phobia is being reconditioned at increased levels of anxiety which, in turn, increase discomfort and anxiety. Heller and Martin (1987) used the Computer Anxiety Rating Scale (CARS) to measure computer anxiety before and after computer training. The results indicated that increased experience leads to a decrease in computer anxiety. However, the high levels of anxiety remaining for some students after treatment suggested that a simplistic belief that increased computer experience alone will decrease computer anxiety is not tenable.

Crable et al. (1994) examined the relationships of cognitive appraisal, locus of control, and prior exposure to computers to computer anxiety. Crable et al. (1994) concluded that cognitive appraisal appeared to have the strongest relationship with computer anxiety in this study. Individuals who assessed an introductory computer class as a challenge or found it to be beneficial in some way scored low in computer anxiety. Those who viewed the situation as threatening or harmful scored higher in computer anxiety. Exposure had slight importance in predicting computer anxiety. Increased prior exposure to computers at home or at work apparently resulted in slightly lowered computer anxiety scores. This result is consistent with previous research and reinforces the conclusion that experience with computers decreases apprehension and uneasiness (Crable et al., 1994).

Igbaria and Parasuraman (1989) found that education is associated with both decreased computer anxiety and more favorable attitudes toward computers. Igbaria and Parasuraman (1989) concluded that increased educational attainment may foster feelings of self-efficacy toward computers in that one can develop the skills needed to use computers and thereby strengthen their confidence in mastering and using computers in their work. Igbaria and Parasuraman (1989) suggested training programs designed to increase individual's knowledge about computers and their operations may be beneficial in alleviating anxiety and reducing potential attitudinal barriers to the use of computers.

In a study of selected characteristics and computer anxiety with North Carolina vocational agricultural teachers, Malpiedi and Blake (1987) found a significant, moderate negative association with daily hours of use, degree of computer use as a teaching tool, degree of computer use for course preparation, degree of computer use for other school activities, and personal use. They also noted that significant negative relationships between the number of computer courses taken and anxiety level and between the number of workshop/inservice hours and anxiety level. They concluded that instructors need to be sensitive to providing successful experiences for all, since high anxiety levels are associated with increased age, and the number of computer workshop/courses completed.

Fletcher (1991) found that teachers' computer anxiety ranged from mild anxiety to high anxiety. Fletcher (1991) also found that a lack of computer skills accounted for 41% of the variance and served as the best predictor of computer anxiety. Fletcher (1991) made the following conclusions: increased knowledge about computers is one way to overcome computer anxiety; the more course work and/or knowledge a person has dealing with computers, the less computer anxiety is exhibited; by increasing the computer skills of the secondary agricultural educator, computer anxiety will be decreased; and when secondary agricultural education teachers with little computer experience use the computer in an isolated situation, they experience a higher level of anxiety.

General Attitudes Toward Computers

Thompson, Higgins, and Howell (1994) defined an attitude as an individual's disposition to respond favorably or unfavorably to an object, person, institution, or event, or to any other discriminable aspect of the individual's world. Liao (1995) indicated that there is a reason to believe increasing students' positive attitudes toward computers may help students in the learning process regarding computers.

Studies have reported that previous experience is significantly related to more positive attitudes toward computers (Loyd & Gressard, 1986). Computer experience is one of the significant factors in predicting computer attitudes (Miller & Varma, 1994). Moon, Kim, and McLean (1994) indicated that students who had more computer experience expressed more positive attitudes towards computers, and a higher number of computer courses completed contributed to this confidence. Students who had more experience with computer programming languages scored significantly higher on all computer attitude subscales. Word processing experience, knowledge of multiple word processing packages, and data entry skills contributed to higher confidence levels and more positive attitudes toward computers.

Levin and Gordon (1989) indicated the advent of computers has had important implications in the job market, Levin and Gordon (1989) noted that many people are unfamiliar with computers and are anxious about the impact computers will have on their lives because of the rapid development of computer technology. This computerphobia manifests itself in negative attitudes toward computers which can have a substantial effect on a person's ability to master skills associated with computers. Harrison and Rainer (1992) indicated that subjects viewing the computer with positive attitudes had significantly more use than subjects with a pessimistic view.

Instruments/Measurements of Attitudes Toward Computers

A number of scales have recently been developed to measure individual attitudes toward computers. The computer attitude scale developed by Loyd and Gressard (1984) consisted of 30 items, divided into three 10-item subscales: computer anxiety, computer confidence, and computer enjoyment. Bannon, Marshall, and Fluegal (1985) conducted a study to develop a scale to determine computer attitudes among students, teachers, educational administrators, and other educators. The attitude survey used by Bannon et al. (1985) study consisted of 17 items: 9 cognitive and 8 affective.

Nickell and Pinto (1986) developed a computer attitude scale which consisted of 20 five-point Likert items (eight expressing positive attitudes towards computers and 12 items expressing negative attitudes). Possible scores on the CAS ranged from a minimum score of 20 (a negative attitude toward computers) to a maximum score of 100 (a positive attitude toward computers). In constructing their computer attitudes scale, Richards, Johnson, and Johnson (1986) adapted several existing scales which resulted in a 27-item scale. After a factor analysis three factors were identified. Based on the item composition of the factors, they called Factor 1 the Liking of Computers factor, Factor 2 the Male Domain factor, and Factor 3 the Necessity of Computers factor.

Swadener and Hannifin (1987) initial draft of their instrument consisted of 30 items keyed to four computer attitude categories: (a) self-confidence in the use of computers, (b) perceived utility of computers, general attitude toward computers, and sex roles in computers. The final version consisted of 17 Likert-type items.

Meier (1988) used an item analysis strategy to develop Computer Aversion Scale. The final version resulted in a 31-item instrument. The three sub-scales included Efficacy Expectations for Computers, Outcome Expectations for Computers, and Reinforcement Expectations for Computers.

The instrument employed by Levin and Gordon (1989) was an attitude questionnaire designed to measure affective and cognitive attitudes toward computers. Levin and Gordon (1989) indicated that the questionnaire consisted of three parts: an affective attitude measure in the form of a semantic differential scale and two cognitive measures: one designed to assess pupils' perceptions of the computers' functional capabilities and one measuring general attitudes toward computers and their uses.

Learning Styles

Learning styles in agricultural education has received much attention from researchers in the discipline. Learning styles has been defined as the variation in the way students learn. The GEFT is an instrument that can be used to classify subjects into two groups: field-dependent and field-independent. The GEFT is an 18-item instrument that determines student learning styles by having subjects locate a previously seen simple figure embedded within a complex figure (Witkin et al., 1971).

Individuals are classified as field-dependent if they score below the national mean of 11.4 on the GEFT. Field-dependent individuals tend to perceive the world globally, find it more difficult to solve problems, be highly sensitive and attuned to their social environment, and tend to favor the spectator approach to learning (Witkin, et al., 1977).

Students who are more successful in locating the embedded figures are classified as field-independent (Witkin et al., 1971). To be classified as field-independent, individuals must score above the national mean of 11.4 on the GEFT. Field-independent individuals tend to view the world more analytically, find it easier to solve problems, and are more likely to favor inquiry and independent study (Witkin et al., 1977).

Numerous studies in agricultural education have used the GEFT to measure learning styles. However, except for a few, most of the learning styles research conducted in agricultural education has been explorative and has not considered the impact of students' learning styles on their computer anxiety and general attitudes toward computers.

Computers are becoming an ever increasing factor in daily life. People are purchasing computers for home use, schools are incorporating computers into curricula, and computers are being used in a wide variety of business organizations (Chou, 1997). People are more likely than ever before to come into contact with computers in one form or another. Therefore it is crucial that agriculture students have low computer anxiety and positive attitudes toward computers so they can effectively utilize computer technology when they enter the workforce. It is also important to have an understanding of whether students' learning styles have a role in their attitudes toward computers.

Purposes and Research Questions

The purpose of this study was to describe the computer anxiety of undergraduate agriculture students and their attitudes toward computers before and after taking a computer applications course. A secondary purpose was to describe any differences in field-independent and field-dependent students' computer anxiety and attitudes toward computers. The following research questions were used to guide the study.

1. What was the level of agriculture students' computer anxiety prior to taking a computer applications course and upon completion of the course?

2. What were agriculture students' attitudes toward computers prior to taking a computer applications course and upon completion of the course?

3. Were there any differences between field-independent and field-dependent agriculture students' computer anxiety and their attitudes toward computers?

Methods

Research Design

A one-group pre-test/post-test design (Campbell & Stanley, 1963) was used to determine differences between agriculture students' pre-test and post-test computer anxiety scores and attitude toward computer scores. The same design was used to determine if there were any differences between field-independent and field-dependent students' computer anxiety scores and attitude toward computer scores.

Population and Sampling

The population of the study consisted of 37 agriculture students at Mississippi State University enrolled in AEE 4203, Computer Applications in Agricultural and Extension Education during Spring semester, 1997. AEE 4203 is a computer applications course for students in the College of Agriculture and Life Sciences. Although class size is typically limited to 18 students, 19 were allowed to register for Section 2 of the class. One student from Section 2 withdrew from the course during the semester.

Treatment

AEE 4203 is taught in a 18-station computer laboratory. The content includes the operating systems, word processing, spreadsheets, the Internet, and presentation software as they apply to agriculture. Students spend four hours per week in the course using a computer. There is a class web site, a course text book, and a graduate teaching assistant The instructor uses a teaching station equipped with a projection unit to demonstrate key principles and concepts. A graduate teaching assistant monitors students' progress as students follow along. An underlying theme to the course is how common principles and concepts apply to all software packages. Furthermore, students are required to relate the course concepts to agricultural sciences. All assignments require the use of a computer. Students complete a major project for each unit of the course. Students select a topic related to their major for each project. In-class assessment consists of a 3 hour lab practical and 1 hour written final. All assignments except for the written final are open book and open note. Additionally, students can use any on-line resource they want except for another person.

Instrumentation

The instrumentation for this study consisted of a computer attitude scale developed by Chou (1997) and the Group Embedded Figures Test (GEFT) developed by Witkin, et al. (1971). The instrument developed by Chou (1997) consisted of three parts: computer anxiety, attitudes toward computers, and demographics.

Each item in part I (computer anxiety) was derived from existing instruments (Loyd & Gressard, 1984; and Robertson et al., 1995). Part I was a Likert scale consisting of twelve items to measure computer anxiety.

Part II is a Likert scale consisting of 26 items. Each item in part II was also derived from existing instruments (Murphy, Coover & Owen, 1989; Loyd & Gressard, 1984; Swadener & Hannafin, 1987; Nickell & Pinto, 1986; Meier, 1988; Richards et al., 1986; Levin and Gordon; 1989; Bannon et al., 1985). Part II consisted of three subscales: computer confidence, computer enjoyment, and the computer as an instructional medium. The first sub-scale of part II measured the confidence in ability to use or learn about computers. The second sub-scale of part II measured computer enjoyment. The third sub-scale of part II measured the attitudes toward the importance and effectiveness of computers applied as an instructional medium. Ten demographic variables were included in part III.

Content and face validity were established by a panel of experts in agricultural education. The instrument was pilot tested with a sample of 30 students who were enrolled in AEE 4203 at Mississippi State University in Fall semester, 1996. The reliability coefficient (Cronbach's alpha) was .83 for the set of 12 questions measuring computer anxiety. The Cronbach's alpha coefficient was .90 for the set of 26 questions measuring the attitudes of secondary agriculture educators toward computers. The Cronbach's alpha coefficients for the sub-scales of the instrument measuring attitudes toward computers were .81 for part I (computer confidence); .86 for part II (computer enjoyment); and .71 for part III (computers as an instructional medium).

The Group Embedded Figures Test (GEFT) was used to determine preferred learning styles, either as field-dependent or field-independent. Individuals scoring greater than the national mean (11.4) were classified as field-independent learners, while those scoring less than the national mean were considered to prefer a field-dependent learning style (Witkin et al., 1971). Internal consistency was measured by treating each scored section (sections two and three) as spilt halves. Witkin et al. (1971) reported a Spearman-Brown reliability coefficient of .82 on the GEFT.

Statistical Analysis

For the purpose of statistical analysis, the researchers treated the students in the study as a sample of possible students who might enroll in the course (Allen, Abaye, McKenna, & Camp, 1995). Based on this approach, inferential statistics were used in the analysis. Dependent t-tests were used to answer the first two research questions. An analysis of co-variance (ANCOVA) was to used to answer the third research question.

Results/Findings

Research Question 1. Prior to taking a computer applications course agriculture students' mean computer anxiety was 24.46 out of a possible 48. Upon completion of the computer applications course, their mean computer anxiety was 20.26. This decrease in anxiety was statistically significant, $t(35) = 4.10$, $p = .05$.

Research Question 2. Prior to taking a computer applications course agriculture students' mean computer attitude was 71.31 out of a possible 104. Upon completion of the computer applications course, their mean computer attitude was 81.14. This increase in attitude was statistically significant, $t(35) = 6.47$, $p = .05$. Table 1 contains a summary of the overall attitude means and the sub-scales.

Table 1.
Comparison of Students' Attitudes Before and After Taking a Computer Applications Course.

	Pretest	Posttest				
Scale	*M*	*SD*	*M*	*SD*	*t*	*p*
Computer Confidence	26.65	4.61	33.63	3.44	10.77	<.001
Computer Enjoyment	24.84	5.47	27.22	6.07	15.18	<.001
Computer as an Instructional Medium	16.89	3.46	19.14	3.62	4.39	<.001
Total	71.31	12.14	81.14	9.52	6.47	<.001

Research Question 3. Tables 2 and 3 summarize the data of an analysis of variance conducted on computer anxiety using the pretest as the covariate. Computer anxiety decreased during the semester for both field-independent and dependent students. There was no statistically significant difference in computer anxiety between field-independent and field-dependent students.

Table 2.
Pretest and Posttest Means of Students' Computer Anxiety (n = 35)

	Pretest	Posttest	
Group		Adjusted	Unadjusted
Computer Anxiety			
Field-independent	24.23	18.98	18.92
Field-dependent	24.92	21.01	21.05

Table 3.
Analysis of Covariance of Students' Computer Anxiety by Learning Styles (n = 35)

Group	*SS*	*df*	*MS*	*F*	*p*
Covariate (Pretest)	74.18	1	74.18	5.44	
Geft	33.95	1	33.95	2.49	.125
Residual	436.56	32	13.64		
Total	544.69	34	16.02		

Table 4.
Pretest and Posttest Means of Students' Attitudes (n =35)

	Pretest	Posttest	
Group		Adjusted	Unadjusted
Computer Confidence			
Field-independent	27.54	34.33	34.69
Field-dependent	25.88	33.21	33.00
Computer Enjoyment			
Field-independent	25.54	27.07	27.85
Field-dependent	24.46	27.29	26.88
Computers as an Instructional Media			
Field-independent	17.23	19.54	19.77
Field-dependent	16.54	18.91	18.77
Total			
Field-independent	72.92	84.33	85.15
Field-dependent	69.20	79.26	78.77

Table 4 summarizes the data for students' attitudes. Students' attitudes increased in all sub-scales during the semester, regardless of learning style. An analysis of variance was conducted on each of the attitude scales using the pretest as the covariate.

As shown in Table 4, overall attitudes toward computers increased during the semester for both field-independent and field-independent students. Field-independent students, however, had statistically significantly higher increases in attitudes than field-dependent students (see Table 5 for the ANCOVA summary). As with the overall attitude score, both field-independent students and field-dependent students increased on the three sub-scales of the attitude score. No significant differences were observed, however, when comparing the two groups on the three sub-scales: computer enjoyment, $f(1,34) = .652$, $p = .425$; computer confidence, $f(1,34) = 1.216$, $p = .278$; computer as an instructional medium, $f(1,34) = .399$, $p = .532$.

Table 5.
Analysis of Covariance of Students' Overall Attitudes toward Computers: Posttest Scores with the Pretest as the Covariate (n = 35)

Group	*SS*	*df*	*MS*	*F*	*p*
Covariate (Pretest)	1425.58	1	1425.58	31.53	
Geft	207.84	1	207.84	4.60	.04
Residual	1446.86	32	45.21		
Total	3080.29	34	90.60		

Conclusions, Recommendations, and Implications

Taking AEE 4203 decreased students' computer anxiety, regardless of their learning styles. This decrease can be explained by the procedures used in the course. One explanation of this decrease is the amount of computer use required of students. The findings of Crable et al., (1994) and Heller and Martin (1987) showed that increased computer experience decreases computer anxiety. However, Heller and Martin (1987) stated that increased experience alone is not sufficient to decrease computer anxiety. Therefore, another explanation of this decrease is the way the experience was structured by organizing projects around areas of student interest and relating assignments to the agricultural sciences. This feature capitalizes on the importance of cognitive appraisal described by Crable et al. (1994).

Taking AEE 4203 improved students' attitudes toward computers, regardless of their learning styles. However, field-independent students' attitudes increased more than field-dependent students' attitudes. This increase can also be attributed to providing students high levels of computer experience both in class and on assignments. This finding supports the conclusions of Miller and Varma (1994) and Moon et al. (1994) that students with more computer experience expressed more positive attitudes toward computers. Levin and Gordon (1989) stressed that it is important that people have positive attitudes toward computers so they are better able to master the skills associated with computers. Therefore a well taught computer course that provides students' ample hands-on experience with a computer contributes toward a positive attitude and provides an environment that is conducive to computer skill development.

One concern is that the field-independent students' attitudes improved more than field-dependent students. One explanation is that field-dependent students favor a spectator approach to learning and the amount of active learning required in the course may be appreciated more by field-independent learners. This concern is lessened somewhat because field-dependent learners' attitudes did improve from the pretest to the posttest.

Agricultural students should take a computer applications course to decrease their computer anxiety and improve their attitude toward computers. These computing courses should be lab intensive and require students to frequently use computers in class, for completion of assignments, and for in-class assessments. Additionally, computer courses for agriculture students should focus on software applications that are clearly applicable and practical for use in the agricultural sciences. Class examples should demonstrate how computers and software can be used in the agricultural sciences. Also students should be allowed to choose topics for their major projects. Providing students real-life problems to solve using a computer increases their educational attainment as described by Igbaria and Parasuraman (1989) and Malpiedi and Blake (1987).

Another probable means of improving students' attitudes and decreasing their anxiety is to increase the use of computer technology in all classes, not just in a computer course. If students are required to use a computer in all courses, they will come to view the computer as a relevant tool for solving problems that they might encounter.

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Field-independent and Field-dependent Undergraduate Agriculture Students' Computer Anxiety and Their Attitudes Toward Computers

A Critique

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This study sought to compare the computer anxiety and attitudes toward computers of agriculture students taking a computer applications course based upon their classification of learning style as field-dependent or field-independent. This study would appear to be one of the first to examine student learning styles and relationships that may exist when students with different learning styles interact with technology. The authors are to be commended for initiating this area of research.

The theoretical bases of this study was well structured and provided the appropriate underpinning necessary to establish the purpose and objectives investigated. The areas of Computer Anxiety, General Attitudes Toward Computers, Instruments/Measurements of Attitudes Toward Computers, and Learning Styles were each discussed in a concise, yet adequate way. The research questions were answerable and gave promise that the study would contribute to the profession.

The important points of the procedures were described appropriately and would be adequate for replication of the study. The Methods section contained appropriate information regarding the Research Design, Population and Sampling procedures, Treatment, Instrumentation, and Statistical Analysis.

There are some questions that arise from reading the Results/Findings section of this study. The authors report that ten demographic variables were included in part III of the instrument. No data are provided to indicate what these variables were or a summary of their findings. One wonders if any of these variables could have influenced the results of this study in light of the small number (37) of students included. Was previous computer experiences one of the variables collected? If either the field-dependent or field-independent group had significantly more computer experience than the other it would affect the results of the study.

No data are provided that support several of the Conclusions/Recommendations/and Implications provided by the authors. The authors suggest that the decrease in computer anxiety regardless of student learning style could be explained by the procedures used in the course. This may be true, but there are no data or observations reported that would allow one to make this conclusion. We already know that classroom atmosphere and experiences can significantly effect student attitudes. In addition, it is well known that a positive teaching atmosphere and student involvement in a variety of activities that are designed to provide student success influence attitudes.

The authors further state that "agriculture students should take a computer applications course to decrease their computer anxiety and improve their attitude toward computers. Such a general statement would not seem to be appropriate for all students. If they come to college with the kind of computer experiences that should be provided in secondary schools, additional computer applications courses would seem to be a waste of valuable time and energy. The best recommendation provided would seen to be the one advocating the increased use of computers in all courses so that students will view the computer as a relevant tool for solving problems. In light of the authors extensive review of the literature, this recommendation would seem to be obvious.

The Perceptions And Attitudes Of Northwest Agriculture Instructors Towards The Use Of Computers In Agricultural Education Programs

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INTRODUCTION

Over the last decade, computers have become an important tool in agricultural education classrooms. Each year the use of computers has become more important to the agriculture instructor. Miller and Kotrlik (1987) reported that "The number of vocational agriculture programs with microcomputers continues to increase as this technology gains support from school systems and as a result of the Carl Perkins Vocational Education Act." If this technology is available to the agriculture instructor, what are the main uses of the computer in the agriculture classroom?

Currently, computers are being used in every phase of the agriculture industry from farms to the largest food processing companies. Students who plan on careers in the agriculture industry must be prepared to use the highest computer technology. If the high school agriculture program has the technology, the instructors should use it to teach students valuable skills. Studies have found that computers are available to teachers (Miller, 1984; Miller & Kotrlik, 1987; Miller, 1990; Elliot, Connors, and Wright, 1994), but what do they use them for? In early studies, the researchers (Church and Foster, 1982; Miller and Kotrlik, 1987) found that computers were mainly used to manage the agriculture instructors grades, classes, and teaching materials. In later studies, the researchers (Zidon, 1985; Raven & Welton, 1989) found that computers were being used more for the benefit of the student. This can help students gain valuable skills needed for a career.

With the increase in computer usage in agriculture programs, it is important to identify what the agriculture instructors think about using computer. With the lack of current research about northwest agriculture instructors perceptions and attitudes towards computer usage, this study was conducted to determine how many computers they have, what software they use, what they use the computer for, what barriers keep them from using the computer, and what their attitudes and perceptions are towards the use of computers in their agriculture program.

PURPOSE OF THE STUDY

This study was conducted to describe northwest agriculture instructors' perceptions and attitudes towards using computers in their agricultural education program. The specific objectives of the study were to:

1. Identify the number and types of computers and peripherals in northwest agricultural education programs.
2. Identify software that is used in agricultural education programs.
3. The current uses of the computers in the agricultural education programs.

4. Identify the attitudes and perceptions of northwest agricultural education instructors towards using the computers in their classroom.
5. Identify the barriers which affect the use of computers in the agriculture program.

METHODS

The researcher developed a self administered questionnaire that would obtain information to accomplish the objectives of the study. Face and content validity was established by three computer experts at a land-grant university. The instrument was pilot tested by fifteen agriculture instructors not a part of the sample. Cronbach's alpha reliability coefficients were .78 and .58 for the two Likert scale sections. Post-hoc reliability coefficients were .88 and .71 for the same Likert scale sections.

The target population of the study was all secondary agricultural education teachers in the states of Washington, Oregon, and Idaho. The first year teachers of each state were removed because they lacked enough teaching experience. A stratified random sample was selected from the teachers in the three states. Sample size was determined by using the equation described by Krejcie and Morgan (1970). The stratified random sample consisted of 158 Washington instructors, 90 Oregon instructors, and 79 Idaho instructors. Total sample size was 327 secondary agricultural instructors. Frame error was reduced by double checking the lists of secondary agriculture instructors with the head state supervisor and teacher educator in each state.

The questionnaire was sent out on October 21, 1996 to the randomly selected sample, with a follow up mailing on November 10, 1996. Phone calls were made to the non-respondent after three weeks. The initial and follow-up mailings and the phone calls resulted in a 72 percent response rate. Early and late respondents were compared on demographic variables. No significant differences were found, therefore the results were generalizable to the target population.

The questionnaire was divided into six sections. The first section asked the number of computers and components (CD-ROM, Printers, etc.) that each agriculture department owned. The second section asked what types of name brand software that they used in their agriculture program. The section also asked how often (daily, weekly, biweekly, or monthly) they used each program. The third section asked what specifically the computer was used for in the agriculture program. The fourth section asked the perceptions and attitudes of the agriculture instructors towards using the computer, the Internet, and multimedia programs in their agriculture program. The fifth section sought to determine any specific barriers that kept the teachers from using computers in their agriculture program. The sixth section asked for demographic information that related to the study.

RESULTS

The study found that the most common types of computers found in agricultural education programs in the northwest are IBM or IBM compatible 486 computers. Over 42% of the teachers responding indicated they had IBM 486 computers in their programs. The second most popular computer was the Apple MacIntosh. Slightly over 36% of the agricultural education programs had these computers. Table 1 shows the data for computer hardware used by northwest agricultural education programs.

The percentage of agricultural education programs with laptop computers was very low. Only 12.7% of programs had IBM compatible laptops while 11.4% of programs had Apple Powerbook computers. The most common type of computer printer was a dot matrix, located in over 59% of the programs. CD-ROM drives were located in 62.4% of the agriculture programs in Washington, Oregon and Idaho. Other peripherals such as scanners, plotters and LCD projection panels were not as widely available, being located in only 17%, 13% and 12% of the programs respectively. Almost 41% of programs had at least one modem, 38% were connected to a local area network (LAN) and 46% had access to the Internet.

Table 1

Computer hardware used by northwest agricultural education programs.

Hardware	Programs with Hardware		Mean	Min.	Max.
	N	%			
IBM Compatibles					
8088 computers	12	5.1	4.41	1	15
286 computers	54	22.8	2.55	1	15
386 computers	70	29.5	3.55	1	25
486 computers	101	42.6	3.72	1	30
Pentium® (586) computers	60	25.3	2.06	1	13
Apple Computers					
Apple II-C	18	7.6	1.55	1	3
Apple II-E	60	25.3	2.75	1	25
MacIntosh	86	36.3	6.48	1	30
Laptop Computers					
IBM Compatibles	30	12.7	1.73	1	20
Apple Powerbook	27	11.4	1.44	1	6
Printers					
Dot Matrix	140	59.1	1.73	1	8
Ink Jet	94	39.7	1.68	1	6
Laser Jet	107	45.1	1.40	1	6
Color (Ink Jet or Laser)	81	34.2	1.24	1	5
Peripherals					
CD-ROM	148	62.4	3.24	1	28
Scanner	40	16.9	1.02	1	2
Plotter	31	13.1	1.12	1	2
LCD Projection Panel	28	11.8	1.03	1	2
Connectivity					
Modem	97	40.9	1.85	1	21
Local Area Network (LAN)	89	37.6	3.23	1	21
Internet Access (America On-Line, Prodigy)	108	45.6	3.15	1	36

Objective two was to determine the types of software used in agricultural education programs. Categories of software included; word processing, graphics presentations, spreadsheet programs, data base programs, financial software, Internet navigators, drafting programs, and course grading software. There was an almost even number of programs that used Microsoft Word for Windows and Word Perfect software for word processing operations. Forty-six percent of programs had Word and 47.7% used Word Perfect. Other word processing software listed by respondents included Microsoft Works, Claris Works and Apple Works. An overwhelming majority of the respondents indicated they were using their word processing programs on a daily basis. Fifty-seven percent of Word users and 58% of Word Perfect users used the program on a daily basis.

The number of programs that used graphics presentation software was somewhat low. Only 31% of programs used Microsoft Powerpoint, 8% utilized Word Perfect Presentations and 1.3% used Harvard Graphics. A few programs indicated they used Corel Draw, Printshop, Hypercard and Pagemaker. The majority of users of graphical presentation software used the programs at least once per week. Microsoft Excel was the leading spreadsheet program. Although only 38% of the teachers indicated they used Excel. Thirteen percent of teachers used Quattro Pro and 11.4% used Lotus 1-2-3. Most of the teachers stated they used their spreadsheet programs on a weekly or monthly basis. Other spreadsheet programs listed included MS Works and Claris Works.

The leading data base program used by agriculture teachers in the northwest was Microsoft Access. Twenty-two percent used Access while only 2..5% reported using Fox Pro. MS Works and Claris Works were again listed as other programs used. The Quicken financial software programs was used in 29.1% of the programs. Microsoft Money was only used by 15 (6.3%) of the programs. Most of the programs reported using financial software weekly or monthly. Netscape Navigator was used by 36.7% of the programs compared to MS Internet Explorer used in only 8 (3.4%) of the programs. Table 2 shows the number and percentage of programs with each type of software and the frequency of its use.

Table 2

Computer software used by northwest agricultural education programs.

Software	Programs with Software		Frequency of Use			
	N	%	Daily	Weekly	Biweekly	Monthly
Word Processing						
Word for Windows	109	46.0	56.6	28.3	10.4	4.7
Word Perfect	113	47.7	57.7	25.0	6.5	11.1
Graphics Presentation						
Microsoft Powerpoint	73	30.8	11.3	29.6	8.5	50.7
WP Presentations	19	8.0	5.9	35.3	23.5	35.3
Harvard Graphics	3	1.3	25.0	50.0	0.0	25.0
Spreadsheet Programs						
Microsoft Excel	90	38.0	25.3	35.6	13.8	25.3
Quattro Pro	30	12.7	6.9	27.6	13.8	51.7
Lotus 1-2-3	27	11.4	4.0	16.0	24.0	56.0
Data Base Programs						
Microsoft Access	53	22.4	11.1	26.7	22.2	40.0
Fox Pro	6	2.5	20.0	0.0	0.0	80.0
Financial Software						
Microsoft Money	15	6.3	15.4	38.5	15.4	30.8
Quicken	69	29.1	6.0	41.8	13.4	38.8
Internet Navigators						
MS Internet Explorer	8	3.4	66.7	0.0	0.0	0.0
Netscape	87	36.7	56.3	28.8	7.5	7.5
Drafting Programs						
CAD	54	22.8	25.6	34.9	2.3	37.2
Land CAD	9	3.8	0.0	0.0	50.0	50.0
Course Grading	122	51.5	65.1	30.3	2.8	1.8

Objective 3 sought to determine the ways computers are utilized in agricultural programs throughout the northwest. The top five most common sited uses for the computers were instructor related. These included writing tests, creating class assignments, student grades, correspondence, and curriculum development. The other five of the top 10 uses were class reports, event announcements, FFA Program of Activities, FFA mailings, and FFA news articles. Table 3 shows the complete list of uses for the computer in ranked order. A sample of some of the additional uses listed by respondents include contest identification, balancing feed rations, global positioning systems, global information systems and the planning of shop projects.

Table 3

Uses of computers in agricultural education classrooms

Computer Uses	Number of Programs	%
Writing tests	193	81.4
Class Reports	185	78.1
Writing class assignments	185	78.1
Student Grades	171	72.2
Correspondence	164	69.2
Event announcements	156	65.8
Curriculum development	152	64.1
FFA Program of Activities	143	60.3
FFA mailings	141	59.5
FFA news articles	133	56.1
Research	132	55.7
Class Presentations	131	55.3
FFA Proficiency Award applications	127	53.6
State FFA Degree applications	125	52.7
Classroom/laboratory inventory	125	52.7
SAE Recordbooks	124	52.3
FFA Secretary's Minutes	122	51.5
Mailing lists	121	51.1
FFA newsletters	121	51.1
American FFA Degree applications	119	50.2
Managing student rosters	118	49.8
Informational posters	115	48.5
E-mail	104	43.9
Landscape Design	101	42.6
Accessing information using the World Wide Web	99	41.8
FFA National Chapter Award application	93	39.2

Table 3 (continued)

Computer Uses	Number of Programs	%
Accounting	88	37.1
Computer Games	87	36.7
Graphics	84	35.4
FFA Event Scoring	79	33.3
Computer Aided Design	68	28.7
Market Analysis	40	16.9
Computer programming	11	4.6

Objective 4 investigated the perceptions of agriculture teachers about the use of computers in their classroom. Sixty-eight percent of respondents felt they were competent at using computers. Additionally 69.4% also felt comfortable using computers. Over 81% of respondents agreed that computers were essential to their agriculture classes. Almost 87% agreed that computers made them more efficient and 85.1% felt computers made their students more efficient. Over 85% of teachers agreed that their students should learn how to used the Internet and 75% agreed that it should be used in agricultural classes. Table 4 shows the percentages of respondents in each category of the Likert scale questions.

Table 4

Agricultural educators' perceptions about computers in the classroom.

Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
Computers are essential to my agricultural science class.	1.7	7.2	9.3	37.7	44.1	4.15
Multimedia presentations spark students' interest.	0.4	2.1	16.7	51.3	29.5	4.07
The Internet should be used in agriculture classes.	0.8	2.5	21.6	37.7	37.3	4.08
I am competent using computers.	2.1	15.8	14.5	44.0	23.5	3.70
Multimedia presentations are an effective method of teaching.	0.9	2.1	20.1	57.3	19.7	3.92
I am comfortable using computers in the classroom.	2.1	11.1	17.4	44.3	25.1	3.79
I believe students should learn to use the Internet.	0.8	1.7	12.3	45.3	39.8	4.21
Students should be able to give multimedia presentations in class.	0.9	4.3	17.4	50.6	26.8	3.98
Computers allow me to be a more efficient teacher.	1.7	2.1	9.3	43.2	43.6	4.25
Computers help my students be more efficient.	0.9	3.0	11.1	50.6	34.5	4.14

Objective 5 was to determine the barriers to using computers by agricultural education instructors in the northwest. The top three barriers indicated by respondents were the cost of computer hardware and software and the teachers' limited experience of using computers as an instructional tool in the classroom. Sixty-seven percent of respondents thought that computer hardware was too expensive and 58.4% thought that computer software was too expensive. Over 42% of instructors agreed that they had limited experience with using computers as an instructional tool. Fifty-one percent of respondents disagreed that they didn't have enough time to develop lessons that use computers. Teachers also disagreed that their administration was not supportive of using computers in the classroom. Respondents also disagreed that they were not comfortable using computers. Table 5 shows the responses to the Likert scale questions.

Table 5

Agricultural instructors' perceptions of barriers to using computers in the classroom.

Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Mean
Computer hardware is too expensive.	0.4	15.0	17.2	52.4	15.0	3.66
Computer software is too expensive.	0.0	19.7	21.9	39.9	18.5	3.57
I have limited experience with using computers as an instructional tool.	15.5	30.5	12.0	33.9	8.2	2.88
Computers are not available in my classroom.	39.1	31.7	3.9	19.6	5.7	2.20
Computer labs are not available in my school.	48.1	30.3	3.5	10.0	8.2	2.00
I don't have time to develop lessons that use computers.	18.9	32.6	18.9	24.9	4.7	2.63
Computer training workshops are not available.	19.4	45.7	12.5	19.4	3.0	2.40
My administration is not supportive of using computers in the classroom.	49.8	36.9	6.9	4.7	1.7	1.71
I am not comfortable using computers in the classroom.	33.9	32.2	13.7	16.3	3.9	2.24
There are limited number of agricultural related programs available.	13.7	25.3	27.5	26.6	6.9	2.87

Objective 6 was to determine demographic information of agriculture instructors in Washington, Oregon and Idaho. The average age of respondents was 40.5 years old. The age of respondents ranged from 23 to 58 years. The mean number of years of teaching experience of the respondents was almost 14 years. The size of the respondents' schools and their agriculture programs ranged widely. School size ranged from a low of 30 students to a high of 2700. Agriculture program enrollment ranged from 6 students to 680. Table 6 shows the personal and school demographic data for the respondents.

Table 6

Demographic data from respondents

Demographic	Mean	Standard Deviation	Minimum	Maximum
Age of respondents	40.47	8.77	23	58
Years of teaching experience	13.72	8.60	1	35
Total enrollment of school	705.00	585.77	30	2700
Total enrollment of agricultural education program	140.66	94.85	6	680

CONCLUSIONS

This study indicated that agricultural education programs across the states of Washington, Oregon and Idaho utilize modern up-to-date computer hardware and software. Many instructors have CD-ROM drives in their computers to use the latest educational programs available on CD. An increasing number of agricultural programs are being connected to the Internet through direct access or telephone modems.

The most widely used type of computer software are word processing programs. Graphics presentation programs are not widely used by agricultural education teachers. Both spreadsheet programs and financial software are available but only used weekly or monthly. This could indicate that these programs are used for keeping students' records on their Supervised Agricultural Experience program or FFA activities. The results of this study would suggest that most agricultural education programs utilize standard computer software common in business and industry today.

The most often cited uses for computers in agricultural education classrooms relate to word processing tasks completed either by the instructor or the students. Writing tests, reports, letters, or announcements are very common uses for the computer. Less often cited uses include computer aided design, including CAD or Land CAD, accounting, graphical presentations, or market analysis.

Agricultural education instructors generally agreed that using computers in their instructional program was very beneficial. Respondents indicated computers made them and their students more efficient learners. Teachers thought they were competent and comfortable using computers in their agricultural program. Teachers did agree that some of the barriers to using computers were the cost of hardware and software. Respondents seemed to have a positive attitude towards their administration's level of support for using computers. Teachers did feel however, that they had limited experience with using computers as instructional tools.

RECOMMENDATIONS

While the majority of agricultural education programs were using newer computers it is vitally important that teachers and students stay on the cutting edge of computer technology. Agriculture teachers should regularly plan on upgrading their inventory of computer hardware and software to allow students experience using the newest computer technology available.

Teachers are comfortable and confident using computers but have indicated a need for more assistance on better ways of using them in their classrooms. Computers need to be utilized as more of a tool for analyzing data and information, improving performance and efficiency and not as just expensive word processors. In order for teachers to better utilize computers more hands-on inservice educational programs need to be developed to educate teachers on better ways of using computers in the classroom. Workshops should cover computer hardware, software and instructional methods that include computer assisted instruction.
As more agricultural education oriented computer programs become available it will be important to properly instruct agriculture teachers on how to incorporate them into their instructional program. More and more teachers are using state developed computer record keeping programs and individual and chapter FFA award applications. Inservice workshops should be planned and conducted by agriculture teacher educators, state supervisors and FFA staff members to instruct secondary agriculture teachers on the proper operation of these computer software programs.

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The Perceptions and Attitudes of Northwest Agriculture Instructors Towards the Use of Computers in Agricultural Education Programs

A Critique

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This study sought to describe northwest agriculture instructors' perceptions and attitudes towards using computers in their agricultural education program. Specifically the study identified; the number and types of computers and peripherals being used, types of software used, current uses of computers in agriculture programs, teacher attitudes and perceptions towards using computers in their classrooms, and barriers which affect the use of computers in agriculture classrooms.

The theoretical bases of this study provided some background for the study. Additional information regarding prior attitudes and perceptions of agriculture teachers towards computer use and the specific uses of computers cited would have been helpful in determining if progress has been made in this vital area of instruction.

The Methods section contained adequate information regarding the Research Design, Population and Sampling procedures, Instrument Development, and Data Analysis. Adequate information was also provided concerning the various sections of the researcher developed questionnaire. Appropriate pilot testing procedures were reported along with acceptable reliability coefficients.

The authors appropriately report the results of the study. It was interesting to this reviewer to find that none of the top five uses of computers in agriculture classrooms were related to student use. In addition, only seven of the 33 uses identified could be remotely tied to student use of computers. A comparison of these uses to earlier studies would have been helpful to assess changes in computer uses in agriculture classrooms.

The authors offer some valid recommendations that need to be strongly considered by the profession. One recommendation was that more hands-on workshops need to be developed to educate teachers on better ways of using computers in the classroom. This study reported that 67.5 percent of the agriculture instructors believed that they were competent using computers leaving one third of the teachers not confident and probably not competent in using computers. Additional studies need to be conducted to determine the specific types of instructional workshops that are needed so that all teachers believe that student use of computers agriculture is needed.

Perhaps another area to consider would be the instruction that preservice teachers are receiving in their undergraduate programs. As more and more information becomes available through internet and other computer resources, it is critical that agriculture instructors are provided with the tools necessary to provide their students with opportunities to use computers. Perhaps teacher education programs need to be upgraded to insure that instruction in how to use computers in the classroom is provided. It would be interesting to assess the attitudes, perceptions and use of computers by teacher educators in teacher preparation programs.

The Relationship Between Students' Learning Styles And Their Achievement In A Computer Applications In Agriculture Course

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Introduction

Computers are ubiquitous. The CyberAtlas (1996) indicated that personal computer users will increase to 225 million people by the year 2000, up from 144 million people in 1995. The student to computer ratio in American education has risen from 1:75 in 1984 to 1:12 in 1994 (Ely, 1995). The time is quickly approaching where one's ability to utilize computers will be prerequisite for day-to-day activities.

Ely (1995) indicated there is no doubt that people live in an information age and computer technology is a symbol of progress. Each day brings new products, software applications, hardware, and opportunities to connect with information resources and people. There has been an inevitability about the growth of computer technology. People have come to expect new developments, new products, and new experiences (Chou, 1997). These expectations have lead to new and expanded uses of computer technologies in all fields including agriculture. Schmidt, Rockwell, Bitney, and Sarno (1994) noted that the use of computers in agriculture is accelerating. Schmidt et al.(1994) stated the following:

> ... the 1980s was a period of growth for the adoption of the microcomputer in agricultural operations. The 1990s is the time to meet the challenge of providing education for agricultural operators to increase the use of microcomputers in managing their agricultural production operations. Extension needs to target both youth young adults as well as the female partner in agricultural operations. Microcomputer educational programs need to be divided so programs address both the basic microcomputer concepts as well as more advanced concepts that further enhance the skills of those who have already started applying the technology in their specific situation. (page not indicated in the electronic format).

The computer has had a dramatic impact on agriculture and is being used throughout the agricultural industry (Fletcher, 1991). Odell (1989) stated that computer use on farms, and in agribusiness, has become an essential part of good management. Raven and Welton (1988) indicated that computers have not only become an integral part of modern society, but also are an intrinsic part of two of the most essential occupational callings in the United States; agriculture and education. There is a clear need for agricultural students to be taught how to use and apply computer technology. What is not clear is the relationship between agriculture students' learning styles and their ability to learn how to use and apply these computer technologies.

Theoretical Framework

Learning styles in agricultural education have received much attention from researchers in the discipline. Learning styles have been defined as the variation in the way students learn. Numerous studies in agricultural education have used the Group Embedded Figures Test (GEFT) to measure learning styles of agricultural students. The GEFT is an instrument that can be used to classify subjects into two groups; field-dependent and field-independent. The GEFT is an 18-item instrument that determines student learning styles by having subjects locate a previously seen simple figure embedded within a complex figure (Witkin et al., 1971).

Individuals are classified as field-dependent if they score below the national mean of 11.4 on the GEFT. Field-dependent individuals tend to perceive the world globally, find it more difficult to solve problems, be highly sensitive and attuned to their social environment, and tend to favor the spectator approach to learning (Witkin, et al., 1977). Students who are more successful in locating the embedded figures are classified as field-independent (Witkin et al., 1971). To be classified as field-independent, individuals must score above the national mean of 11.4 on the GEFT. Field-independent individuals tend to view the world more analytically, find it easier to solve problems, and are more likely to favor inquiry and independent study (Witkin et al., 1977).

Studies have reported a great deal of information regarding the learning styles of college agriculture students. Most of the learning styles research conducted in agricultural education has been exploratory and has not considered students' learning styles impact on learning and achievement. However, there have been a few studies that have studied the relationship between learning styles and student achievement. In a 1994 study, Marrison and Frick determined that learning styles had no significant effect on students' overall achievement in an agricultural economics course. Also, no significant difference was found on students' perceptions of lecture versus multimedia instruction. However, field-independent and field-dependent students did differ in three areas: ease of computer use, effect of sound, and belief that multimedia computer modules were more exciting than lecture. Field-dependent students expressed the need for sound, while field-independent learners found the multimedia computer module easy to use and more exciting than traditional lecture (Marrison & Frick, 1994). Furthermore, Marrison and Frick (1994) concluded that if instruction was adapted to individual's cognitive styles, instruction will be more effective.

Cano, Garton, and Raven (1992b) found that agricultural education pre-service teachers preferring a field-independent learning style achieved higher scores than those preferring field-dependent on overall course score and in a microteaching laboratory. In 1994, Cano and Garton (1994a) supported findings of the Cano, Garton, and Raven (1992b) study. Conclusions were made that field-independent pre-service agricultural education teachers achieved higher scores in a Methods of Teaching Agriculture course than field-dependent pre-service teachers.

Much of the research that exists regarding the relationship between learning styles and computers is focused on the use of the computer as an instructional tool. Day, Raven, and Newman (1997) found that learning styles had no effect on student achievement or attitudes in Web-dependent instruction or in traditional instruction of a technical writing course in agricommunications. Additionally, there were no interaction effects between learning style and type of instruction (Web-dependent or traditional) on students' achievement and attitudes.

Liu (1994) examined the relationship between different learning strategies by field-independent and field-dependent learners in a hypermedia environment. Findings indicated that different learning styles groups employed different learning strategies in accomplishing the same task. Hypermedia has offered a promise of finding a match of learning styles to instruction.

Mismatched cognition/learning style can be an important source of learning failure (Chinien & Boutin, 1993). The differences in information processing habits of students can be sources of considerable variation in learning. According to Anderson and Adams (1992), one of the most significant challenges that university instructors face is to be tolerant and perceptive enough to recognize learning differences among their students. Many instructors do not realize that students vary in the way they process and understand information.

Chinien and Boutin (1994) suggested implications for educational technologists in addressing the differences among learners during the instructional design process. They reported that the learning styles of field-independent and field-dependent students constituted an important dimension of individual differences among students regarding their preferences for various modes of gaining, storing, processing, and using information. These differences can be a source of variation in learning.

While there has been research in the area of learning style and instruction, there is a definite need for more research on how students are able to use and apply what they do learn regarding computer technologies. Research in these areas is needed to determine the effectiveness of instruction with different learning styles (Liu, 1994). Marrison and Frick (1994) concluded that if agricultural educators can adapt and utilize multimedia technology as a teaching tool capable of improving every student's ability to learn, the entire discipline will benefit.

The agricultural industry is hurtling toward the 21st Century. As society and agriculture moves from the mechanized age into the information age the need for agriculturalists to be proficient users of computers is crucial. Agriculturalists must be able to learn how to use and apply current computer technologies to access, analyze, and apply information. Additionally, agriculturalists must taught how to become proficient self-learners of new computer technologies in order to stay current. Therefore, it is imperative that the relationship between learning styles and students' ability to use and apply computer technologies is identified.

Purpose and Research Questions

The purpose of this study was to determine the relationship between agriculture students' learning style and their achievement in a computer applications in agriculture course. The following research questions were used to guide the study.

1. What were the agriculture students' learning style as measured by the Group Embedded Figures Test (GEFT)?

2. What was the relationship between agriculture students' learning style and their achievement in a computer applications in agriculture course as measured by their scores on the following:
   - Homework score
   - The four major class projects
   - Lab practical
   - Total class score

3. What was the relationship between agriculture students' learning style and their authentic learning in a computer applications in agriculture course as measured by their time to complete the lab practical and their score on a bonus question requiring tranfersability of principles learned during the course.

Methods

Research Design

The design of the study was descriptive-correlational (Ary, Jacobs, & Razavueh, 1996). Relationships were studied using Pearson's product-moment correlations for interval-level data and point-biserial correlations were used when comparing interval and nominal data.

Population and Sampling

The population of the study consisted of 37 agriculture students at Mississippi State University enrolled in AEE 4203, Computer Applications in Agricultural and Extension Education during Spring semester, 1997. AEE 4203 is a computer applications course for students in the College of Agriculture and Life Sciences. There were 19 students in Section 1 and 18 students in Section 2. One student from Section 2 withdrew from the course during the semester.

Course Description

AEE 4203 is taught in a 18-station computer laboratory. The content includes the operating systems, word processing, spreadsheets, the Internet, and presentation software as they apply to agriculture. Students spend four hours per week in the course using a computer. There is a class web site, a course text book, and a graduate teaching assistant The instructor uses a teaching station equipped with a projection unit to demonstrate key principles and concepts. A graduate teaching assistant monitors students' progress as students follow along. An underlying theme to the course is how common principles and concepts apply to all software packages. Furthermore, students are required to relate the course concepts to agricultural sciences. All assignments require the use of a computer. Students complete a major project for each unit of the course. Students select a topic related to their major for each project. In-class assessment consists of a 3 hour lab practical and 1 hour written final. All assignments except for the written final are open book and open note. Additionally, students can use any on-line resource they want except for another person.

Instrumentation

The instrumentation for this study consisted course assignments, authentic learning measures, and the Group Embedded Figures Test (GEFT) developed by Witkin et al. (1971). The course assignments included students' total homework score, word processing project, spreadsheet project, World Wide Web project, presentation project, and comprehensive lab practical. The total homework score was comprised of 13 homeworks assigned during the semester. Each assignment stressed principles and concepts learned in class. Four units had a major project. For the word processing project students had to research computer use in their area of study and write a 3 to 6 page paper using WordPerfect 6.1. There were a number of requirements that had to be included in the paper (e.g. footers, headers, a formatting tool not taught in class). The spreadsheet unit required students to design a spreadsheet that solved a numbers-oriented problem in their area of study. There were a number of requirements that the spreadsheet had to include (e.g., an logic function, at least two unique formulas, absolute and relative addresses). Students were required to construct a personal home page for their WWW project. There were also specific requirements for this project (e.g., at least three headers, a HTML code of their own choosing not already required, an in-line image). The presentation unit required students to construct a presentation using Harvard Graphics 3.0 about an assigned emerging technology. The lab practical was a 3 hour comprehensive computer-based exam that required students to demonstrate their mastery of every course objective. A graduate teaching assistant not involved with this study graded all of the course assignments.

Two measurements were used to test authentic learning. The first authentic learning measurement was the time it took students to complete the lab practical. The second authentic learning measurement was a bonus problem on the lab practical. Students had been taught how to use WordPerfect 6.1 during the semester. The lab practical bonus required students to complete one of the WordPerfect 6.1 problems using Microsoft Word 2.0 for Windows. Only one of the 37 students had used Microsoft Word 2.0 prior to the class.

The Group Embedded Figures Test (GEFT) was used to determine preferred learning styles, either as field-dependent or field-independent. Individuals scoring greater than the national mean (11.4) were classified as field-independent learners, while those scoring less than the national mean were considered to a prefer field-dependent learning style (Witkin et al., 1971). Internal consistency was measured by treating each scored section (sections two and three) as spilt halves. Witkin et al. (1971) reported a Spearman-Brown reliability coefficient of .82 on the GEFT.

Data Analysis

Descriptive statistics were used to answer the first research question. Pearson's product-moment correlations were used to answer the second research question. A point-biserial correlation was used to answer the third research question. Data were analyzed using SPSS.

Results/Findings

What were the agriculture students' learning style as measured by the Group Embedded Figures Test (GEFT)?

Of the 36 students, 29 were male. The typical student was a 23-year-old sophomore male. Students scored a mean of 9.35 on the GEFT which is below the national average of 11.4.
23 of the students were field-dependent while the remaining 13 were field-independent. Table 1 contains means and standard deviations for other selected demographic variables. As indicated in Table 2, 63. 2% of the students had a computer available at home. On average the students spent 2.5 hours per day and 3.3 days per week on the computer.

What was the relationship between agriculture students' learning style and their achievement in a computer applications in agriculture course as measured by their scores on the following: homework score, four major class projects, lab practical, and total class score.

To determine if the relationships between agricultural students' learning styles and their achievement in a computer applications course, correlation coefficients were calculated. Pearson correlations were calculated for the selected course assignments. All relationships were interpreted as per Davis (1971). In the scale, according to Davis, a coefficient of .01 to .09 indicates a negligible relationship, .10 to .29 indicates a low relationship, .30 to .49 indicates a moderate relationship, .50 to .69 indicates a substantial relationship, and .70 or higher indicates a very strong relationship.

A moderate positive relationship was observed between learning styles and total class score ($r = .386$). Field-independent students were more likely to have a higher total class score than field-dependent students.
A moderate positive relationship was also found between learning styles and homework score ($r = .381$). This indicates that the more field-independent the student, the higher the homework score.

There was a substantial positive relationship between learning styles and lab practical score ($r = .579$). This finding indicates that the more field-independent a student, the higher his or her score on the lab practical.

Table 1
Demographics of Students Enrolled in AEE 4203/6203

Variable	*M*	*SD*
Age	23.03	5.26
Computer Courses		
High School	1.39	3.29
College	1.35	1.35
Computer Software		
Communication	1.08	1.16
Database	.27	.77
Desktop Publishing	.14	.35
Word Processing	1.70	1.27
Operating Systems	.92	.92
Presentation Graphics	.49	.80
Spreadsheet	.62	.89
Education	14.05	2.80
Learning Style (GEFT)	9.35	5.27
Time on Computer		
Hours per day	2.54	6.46
Days per week	3.36	2.61
Days per year	81.84	98.60
Typing		
Words per minute	31.67	17.48

Table 2
Frequency of students' computer availability (n = 38)

	f	%
Computer at home	24	63.2
No Computer	12	31.6

Table 3
Means of Selected Course Assignments and Relationships to Learning Styles

Course Assignment	M_1 (Field-independent)	M_2 (Field-dependent)	*r*
Homework score	30.92	27.58	.381
Major class projects			
Homepage	94.31	86.96	.232
Harvard Graphics®	95.08	89.04	.178
Word Perfect®	93.31	83.22	.295
Quattro Pro®	85.38	71.30	.289
Lab Practical	191.38	136.57	.579
Total Class Score	94.74	79.72	.386

What was the relationship between agriculture students' learning style and their authentic learning in a computer applications in agriculture course as measured by their time to complete the lab practical and their score on a bonus question requiring tranfersability of principles learned during the course.

A negative moderate correlation was observed between learning styles and time required to complete the lab practical($r = -.381$). Field-independent students generally completed the lab practical for the course in less time than field-dependent students (see Table 4). Of the 16 students (45.71%) who attempted the bonus question (see Table 5), there was a low positive relationship between bonus score and learning styles. However, the relationship between learning styles and whether or not a student attempted the bonus was positive and substantial ($r_{pb} = .501$), indicating that field-independent students were much more likely to have attempted the bonus question.

Table 4
Completion Time of Lab Practical and Score on Bonus Question Means and Relationship to Learning Styles

Variable	M_1 (Field-independent)	M_2 (Field-dependent)	*r*
Completion Time	143.38	168.55	-.381
Bonus Score	22.87	21.00	.244

Table 5
Frequency of Bonus Attempts (n = 35)

	f	%
Attempted	16	45.71
Did Not Attempt	19	54.29

Conclusions

As a group, students in the class tended to be field-dependent, with a mean 2 points below the national average on the GEFT, and 23 of the 36 students being classified as field-dependent.

Field-independent students were more likely to achieve higher in the course than field-dependent students. This difference was especially relevant for the lab practical, homework score, and total class score. The difference was not as great for the four class projects.

Field-independent students performed at a higher cognitive level than field-dependent students and were more efficient computer users. They could perform the required skills of the course faster and were more likely to attempt the bonus question.

Implications and Recommendations

Either the concepts taught in the course or the methods used were more appropriate for field-independent students. One explanation is that the instructor and the lab assistant were both highly field-independent and as a result learning failure occurred because of mismatched cognitive/learning style as described by Chinien and Boutin (1993). However, the instructors were cognizant that students vary in the way they process information and specifically selected methods appropriate for both learning styles. For example, a textbook was used and students were allowed to work in groups on homework assignments, both of which favor field-dependent learners. Students were also allowed to pick the topic of their major projects which meets the needs of field-dependent students (Raven, 1992). In addition, a course web site was used to support instruction which both types of learners enjoy (Day, Raven, & Newman, 1997). Therefore, the concepts taught in this computer class appear to be easier learned by the field-independent students.

Field-independent learners are less affected by the surrounding field (Witkin et al., 1971). Therefore, they tend to prefer a more impersonal orientation to their learning and relate better to the way computer programs are organized. For example when saving a file, field-independent learners have less difficulty picking out the correct sub-directory from the directory tree. Perhaps because they find the subject matter easier to understand, field-independent students internalized the concepts of the course more than field-dependent students, allowing them to perform better and more efficiently in the class. This understanding would, in turn, allow them to transfer the concepts required to complete the bonus question on the lab practical.
Field-dependent learners find the method of processing information used by computers to be impersonal, which decreases their interest and enjoyment of computer instruction. Further research is needed to determine methods of teaching computers that allow the instructor to provide a more personal interface between the field-dependent learner and the computer.

Two possible methods that need to be studied include increased use of hypermedia and the development of stories/analogies to increase understanding. The increased use of hypermedia might take the form of an enhanced course web site, possibly including more immediate feedback for the students, more discussion of key concepts by students and instructor(s), and uses of multiple media to teach each concept. Increased use of hypermedia is effective for both learning styles, according to Liu (1994) and Day, Raven, and Newman (1997).

Providing stories and analogies is another means instructors might use to personalize computer instruction for field-dependent learners. For example, field-dependent learners have problems visualizing the directory structure used by most operating systems to store files. On the other hand, everyone has been in a house and understands the concepts of rooms within a house, closets within rooms, and items within rooms and closets. Such analogies can be very successful in helping field-dependent learners relate to the concepts of folders/directories and files.

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The Relationship Between Students' Learning Styles And Their Achievement in a Computer Applications in Agriculture Course

A Critique

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This study sought to determine the relationship between agriculture students' learning style and their achievement in a computer applications in agriculture course as measured by achievement on several class projects and an authentic learning lab practical and bonus question. The ability of agriculture students to effectively utilize computers in the agriculture industry is critical to their success. If differences in achievement in a computer course are linked to student learning styles this could have a significant impact on teaching and learning.

The theoretical bases of this study was well structured and provided the appropriate underpinning necessary to establish the purpose and objectives investigated. The authors provided a good review of the literature to establish a need for the study. One item missing from the review of literature is the link between time required to complete an authentic assessment activity and student learning. This would have been helpful and is an important factor in the results and conclusions section of this study.

The important points of the procedures were described appropriately and would be adequate for replication of the study. The Methods section contained appropriate information regarding the Research Design, Population and Sampling procedures, Course Description, Instrumentation, and Data Analysis.

The authors provided some demographic information concerning the students in this study. No explanation was provided regarding some of the data however. For example, what is the significance of a 1.39 and 1.35 mean for computer courses in high school and college. Are there relationships between the means of the various computer software packages used by students and student achievement? Does having a computer at home influence student achievement?

Does time spent on a computer influence student achievement? There would seem to be a number of unanswered questions that are critical to understanding the results of this study.

One of the biggest concerns for this reviewer is the assumption that time to complete a task is related to student learning. Was the quality of the work on the project taken into consideration as a factor of time. It is one thing to do something quickly and another to do it well. In addition, no data were provided to determine if students had any learning disabilities. Because of the small number of students in the study this could have explained the variation in speed of completion of the assigned task. As the parent of a college student with dyslexia I know from first hand experience that time to complete a task does not correlate to student learning. This reviewer believes that additional information is necessary before one can conclude that learning style is the factor that explains the differences of student achievement observed.

The authors identify several areas needed for further study including the effect of the increased use of hypermedia and the development of stories/analogies to increase student understanding. These would seem to be needed for field-dependent learners to become more successful in utilizing computers as a tool. It is hoped that the authors will continue their research in this important area.

Concurrent Session I

Theme:
Learning Styles

Differences in Learning Styles of County Extension Faculty in Florida Based Upon Selected Personal and Organizational Characteristics

Matt Baker, University of Florida
Rick Rudd, University of Florida
Tracy Hoover, University of Florida
Tammy Grant, University of Florida

Chairperson:
Van Shelhamer
Montana State University

Effects of Teaching Approach on Subject Matter Retention Across Learning Styles

James E. Dyer, Iowa State University
Edward W. Osborne, University of Florida

Discussant:
George W. Wardlow
University of Arkansas

Learning Styles of Navajo Students Enrolled in Secondary Agricultural Education

Vanessa D. Vicenti-Henio, New Mexico State
Robert M. Torres, New Mexico State Univ.

Facilitator:
M. Susie Whittington
The Pennsylvania State University

The Relationship Between Learning Styles, Academic Major, and Academic Performance of College of Agriculture Students

Jamie Cano, Ohio State University
Terri L. Porter, Ohio State University

Differences In Learning Styles Of County Extension Faculty In Florida Based Upon Selected Personal And Organizational Characteristics

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Introduction

According to Seevers, Graham, Gamon, and Conklin (1997) learning styles is defined as "characteristics and preferred methods of gathering, organizing, and interpreting information" (p. 134). These same writers also indicate that it is very unlikely that extension professionals will face audiences that have homogeneous learning styles. As a result, variability of instructional delivery and evaluation is essential in delivering quality county-based programs.

To some degree, learning style of the teacher impacts the way a teacher guides the learning process (Jacobson, 1992; Dunn & Dunn, 1979; Garger & Guild, 1984). However, only a limited amount of research has been conducted with professionals employed in cooperative extension. Rollins and Yoder (1993) utilized the Kolb Learning Style Inventory (LSI) on 199 extension professionals in the Pennsylvania Cooperative Extension Service. The LSI classifies learners into four areas: convergers, divergers, assimilators, and accommodators. Convergers typically do not enjoy interacting with others and prefer the technical aspects of problem solving. Divergers are more people-oriented and accentuate experiences that are concrete and reflective in nature. Assimilators use reasoning that is inductive in nature, are less people-oriented than convergers, and evaluate ideas by theoretical accuracy as opposed to practical significance. Accomodators prefer experiences that are concrete, being involved in novel experiences, activity for the sake of activity, and task completion. These Pennsylvania researchers found that 29% of their county faculty were classified by the LSI as accommodators, 27% as assimilators, 26% as convergers, and 18% as divergers.

Seevers (1995) utilized the Principles of Adult Learning Scale (PALS) instrument to measure the learning styles of 609 extension professionals in the Ohio State University Extension organization. She found that these subjects had a more teacher-centered behavior pattern than the norm-reference group. In addition, she used an instrument developed by Van Tilburg and Heimlich (1990) to determine the degree to which an instructor is sensitive to learner needs and degree to which learners are involved in developing individualized instructional experiences. A third instrument used in the study included an attitudinal assessment toward being an adult educator. Using stepwise regression she discovered that 16% of the variance in "teaching style" could be predicted by a linear combination of sensitivity and inclusion, number of classes taken in adult education, and attitude toward being an adult educator.

In agricultural and extension education, the Group Embedded Figures Test (GEFT) has been the most widely utilized instrument in measuring learning style. According to Guild and Garger (1985), the GEFT developer has been programmatically involved in "the most extensive and in-depth research on cognitive style conducted in the last 50 years" (p. xii). The national mean on the GEFT is 11.4 (Witkin, Oltman, Raskin, & Karp, 1971). For the purpose of classification, individuals scoring greater than the national mean are considered field independent, and those scoring less than the national mean are field dependent. Field dependent learners have global perceptions, are sensitive to their social environments, have highly developed social skills, favor a spectator approach to learning, and need structured learning environments. Field independent learners on the other hand are discerning of distinct parts, are accomplished at logical reasoning, may have poorly developed social skills, and can provide their own structure to facilitate learning.

Although research using the GEFT has been conducted on a number of populations (college students, high school students, 4-H youth, college faculty, and high school teachers), little is known about the relationship between GEFT performance by county extension faculty. In 1996, Baker, Hoover, and Rudd utilized the GEFT in measuring the learning styles of 49 county extension faculty in Florida. They reported that as a whole, more extension faculty were field dependent learners (65%) than field independent learners. They also found that county faculty in their 30's scored highest on the GEFT. In terms of gender, females scored higher on the GEFT than males. However, these researchers limited their findings to a purposeful sample of 49, and a number of questions remained unanswered as a result of their study. Using a much larger sample, are there differences in GEFT based upon program area, gender, administrative role, and location? What relationships exist between GEFT and age? These are the questions that this study addressed.

Theoretical Framework

County faculty bring into the programming process unique characteristics based upon formative experiences (social class, age, gender), educational experiences (university attended, undergraduate and graduate programs), and other characteristics (intelligence, motivation, personality traits, presentation skills). Both Mitzel (1960) and Dunkin and Biddle (1974) refer to such characteristics as presage variables in their studies of teaching effectiveness.

In 1995, Torres and Cano proposed a benchmark model for the development of cognitive abilities (Figure 1). Both teacher-related factors and learning styles were two of the five factors included in the model that were thought to either directly or indirectly influence cognitive ability. They indicated that teacher-related factors consisted of philosophical beliefs, preparation, instructional delivery, tests and assignments, and cognitive expectations. In addition, personal characteristics included gender, age, socio-economic status, educational and occupational aspirations, personal life experiences, and intelligence.

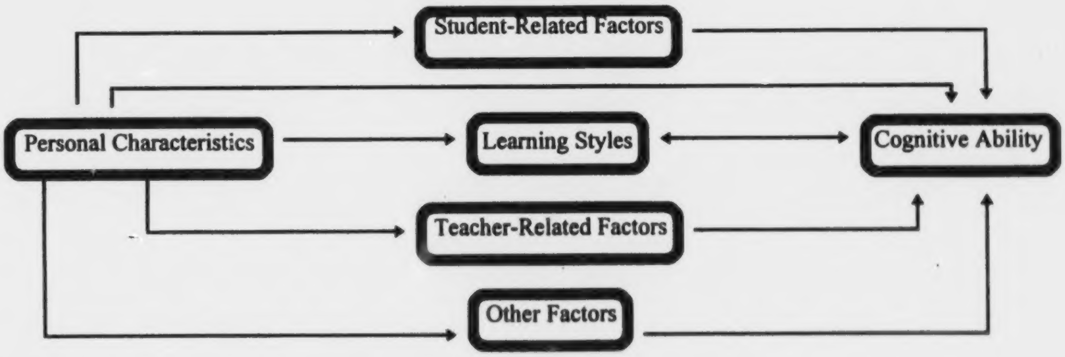

Figure 1: Conceptual Framework for Critical Thinking (Torres & Cano, 1995)

The Torres and Cano model proposed that personal characteristics influenced learning styles, teacher-related factors, other factors (including class size, institution size, environmental elements), and cognitive ability. In addition, they indicated that a bi-directional relationship existed between cognitive ability and learning styles.

For this study, the authors investigated differences in learning styles of county faculty based upon personal (age and gender) and organizational characteristics (program area, administrative role and location). The author of the GEFT indicates that although the socialization process and genetics influences one's learning style, the socialization process appears to be most influential (Witkin, 1976). In terms of socialization, the early experience with a caregiver seems to be important. Field independent learners are nurtured in the early childhood stage to be independent. Field dependent learners are more strongly influenced by peer groups and authority figures. In terms of language development, Claxton and Murrell (1987) summarized Witkin's work by stating:

> Field dependents and field independents exhibit differences in speech patterns, field dependents referring more to others than to themselves as they talk, field independents using more personal pronouns and active verbs (p. 9).

Torres and Cano (1995) speculated that both age and gender influenced learning styles. Rudd, Baker, Hoover, and Yermal (1997) proposed that many leadership characteristics advanced by scholars in the discipline could be captured by the dichotomous assignment of personality traits associated with field dependent and field independent learners. Program area was included due to proposed differences in learning styles by individuals in differing disciplines. Hoover, Baker, and Rudd (1997) reported that average GEFT scores by undergraduate students varied substantially when compared across college major. In addition, Rudd, Baker, and Hoover (1997) found considerable variance in GEFT scores of college faculty when examined by academic unit. Location was included in the model due to the heterogeneous nature of county programs in Florida. With the exception of California, Florida agriculture is the most diverse in the nation regarding the number of commodities grown. In addition, the state's population continues to grow. Population growth is expected to increase by 2.5 million between 1995 and 2000, which will result in a projected 15.4 million residents. Consequently, location within the state (northern, central, southern) might impact a faculty member's willingness to work with unique clientele groups and/or stakeholders of the many agricultural commodities grown in the state.

Purpose and Objectives

The purpose of this study was to determine the extent that selected organizational and personological characteristics influence the learning styles of county faculty in the Florida Cooperative Extension Service. The following objectives were developed to guide the researchers:

(1) identify selected personal and organizational characteristics of county faculty; and

(2) determine if significant differences and relationships exist between learning styles and selected personal and organizational characteristics.

Methodology

The population for this descriptive-exploratory study consisted of 250 county extension faculty employed in all of the 67 counties in the state. The sample consisted of 197 county faculty in a 54 county region in Florida. The counties consisted of both rural and urban areas. Data were collected in conjunction with a series of teaching/learning workshops conducted by the researchers from February, 1996 through April, 1997.

Two instruments were used to collect data for the study. Learning styles were measured by the GEFT (Witkin et. al, 1971). Reliability and validity have been established by the GEFT developers. Demographic data were collected by way of a researcher-developed questionnaire. Face and content validity were established for the questionnaire by a panel of experts in the Department of Agricultural Education and Communication at the University of Florida.

Data were analyzed using the *SPSS/PC+* statistical software package. Descriptive statistics were used to summarize the data. The subjects used as the sample for this study were considered as a slice of time sample of the target population of all county faculty in the state. Therefore, inferential statistics were used to ascertain significant differences between differing variables and GEFT scores. One-way ANOVAs were used to determine if differences existed between selected categorically-measured personal and organizational characteristics and GEFT scores. A Pearson Product Moment correlation coefficient was used to determine the relationship between GEFT scores and the interval-level personal characteristic of age. For this study the convention by Davis (1971) was used to describe the measure of association. An alpha level of 0.05 was established *a priori*.

Findings

The initial research objective was to describe county extension faculty in terms of selected organizational (program area, administrative role, and location) and personal characteristics (age and gender). Table 1 indicates that about 35% of the county faculty had responsibilities in agriculture and natural resources. Another 30% were involved in programming related to family and consumer sciences. Only about 16% were engaged in programming associated with youth.

Sixteen percent of the sample consisted of individuals serving as county directors. The Florida Cooperative Extension Service is divided geographically into five districts. Sample subjects represented four of the five districts ranging from the northern border to Key West in the south. Table 2 reveals that faculty in District IV (South-central Florida including Tampa) represented about 29% of the sample, and faculty in District V (South Florida including Palm Beach and Miami), about 23% of the sample. As revealed in Table 3, ages of extension professionals ranged from 22 to 67 (M=42.37, SD=10.32). Of the 197 county faculty, over 55% were female.

The second research objective was to determine if significant differences and relationships exist between GEFT scores and selected personal and organizational characteristics. The average GEFT score for the 197 county faculty was 9.67 (SD = 5.02). Scores ranged from a low of zero to a high of eighteen. As a whole, more extension professionals were field dependent learners (58%) than field independent learners.

Table 1

Description of Selected County Faculty by Program Area

Program Area	n	Percent
Agricultural and Natural Resources	68	34.5
Family and Consumer Sciences	58	29.4
4-H and Youth Development	31	15.7
Multiple Program Areas	35	17.8
Missing	5	2.6
Totals	197	100.0

Table 2

Description of County Faculty by District

Program Area	n	Percent
District I[1]	46	23.4
District II[2]	49	24.9
District IV[3]	57	28.9
District V[4]	45	22.8
Totals	197	100.0

When county faculty were examined by program area and GEFT scores (Table 4), faculty with a 4-H and youth development assignment scored slightly higher (M= 10.16, SD=4.12) than faculty in the other three program areas. However county faculty did not differ significantly on their GEFT scores based upon program area (F=0.12, p=.95). Table 5 shows that no significant difference was found between the leadership role of county faculty and GEFT score (F=1.38, p=.24). County directors scored only slightly higher (M=10.62, SD=5.00) on the GEFT than non-county directors (M=9.49, SD=5.02). According to Table 6, location of county faculty did not influence GEFT scores significantly (F=.53, p=.66).

Table 3

Description of County Faculty by Age

Age Range	n	Percent
22 - 29	32	16.2
30 - 39	37	18.8
40 - 49	80	40.6
50 - 59	35	17.8
60 or Greater	9	4.6
Missing	4	2.0
Totals	197	100.0

M = 42.37, SD = 10.32

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[1] Northwest including Pensacola and Tallahassee

[2] Northeast including Gainesville and Jacksonville

[3] South-central including Tampa

[4] South including Palm Beach and Miami

Table 4

ANOVA of Program Area by GEFT Score (n=191)

Program Area	n	M	SD
Agricultural and Natural Resources	67	9.61	4.85
Family and Consumer Sciences	58	9.57	5.23
4-H and Youth Development	31	10.16	4.12
Multiple Program Areas	35	9.88	4.97

Source	df	SS	MS	F	p
Between Groups	3	9.04	3.01	0.12	.95
Within Groups	187	4691.87	25.09		
Totals	190	4700.91			

Table 7 reveals that gender did not have a significant influence on GEFT score (F=.49, p=.49). Males (M=9.41, SD=5.32) and females (M=9.92, SD=4.79) scored about equally. Although statistically significant, the relationship between age and GEFT score (Table 8) was negative in direction and low in magnitude (r=-.19).

Table 5

ANOVA of Administrative Role by GEFT Score (n=196)

Administrative Role	n	M	SD
County Directors	32	10.63	5.00
Noncounty Directors	164	9.49	5.02

Source	df	SS	MS	F	p
Between Groups	1	34.63	34.63	1.38	.24
Within Groups	194	4882.48	25.17		
Totals	195	4917.11			

Table 6

ANOVA of Location by GEFT Score (n=196)

District Number	n	M	SD
District I	46	9.76	5.05
District II	48	9.04	5.08
District IV	57	10.26	4.69
District V	45	9.51	5.40

Source	df	SS	MS	F	p
Between Groups	3	40.52	13.51	0.53	.66
Within Groups	192	4876.58	25.40		
Totals	195	4717.10			

Table 7

ANOVA of Gender by GEFT Score (n=195)

Gender	n	M	SD
Male	85	9.41	5.32
Female	110	9.92	4.79

Source	df	SS	MS	F	p
Between Groups	1	12.30	12.30	0.49	.49
Within Groups	193	4882.85	25.30		
Totals	194	4895.15			

Table 8

Relationship Between Age and GEFT Score (n=192)

	r[1]
Age	-.19[2]

[1] Pearson Product Moment

[2] $p < .05$

Conclusions

About one-third of the participating county faculty in this study had an agricultural and natural resources assignment. Thirty percent were involved in family and consumer sciences programming. Only 16% were involved in working with youth, and 18% had multiple responsibilities (generally agriculture and youth, family and consumer sciences and youth, or agriculture and administration).

In terms of location, 29% were located in counties in the south-central portion of the state including Tampa. The smallest district in terms of faculty representation was in south Florida including Palm Beach and Miami (23%). The average age of the county faculty was 42. Over one-half of the subjects were female.

More county faculty were field dependent than field independent. In terms of GEFT scores and personal and organizational characteristics, no significant differences were found. Although the relationship between GEFT scores and age was statistically significant, in practice age could explain little variance in GEFT scores. As a result of these findings, future models with this population should exclude the specific personal and organizational variables included in this study. Future researchers should explore differences in learning styles based upon intelligence, personal and professional experiences, motivation, personality traits, and creativity, to name a few.

Implications

Two implications emanate from this study. The initial implication is associated with the professional development of county faculty. As a group of learners, specialists working with county faculty should plan programs that are tailored to the field dependent learner. Like most learners, county faculty would be more comfortable when they are taught in an environment in which they learn best. Some of the teaching characteristics of county faculty include the use of questions when introducing topics, the use of probing questions, a tendency to provide inadequate feedback in an effort to avoid negative evaluation, and the establishment of a warm learning environment. Little is known about the learning styles of state specialists in the Florida Cooperative Extension Service. There is a need for additional research to identify the learning styles of state specialists.

The second implication involves county programming. It is important that county faculty be cognizant of their clients' learning styles. According to Israel (1995), "one basic ingredient in any plan for attaining excellence in Extension programs is careful attention to the characteristics of extension clientele" (p. 1). In a study by Baker, Rudd, and Hoover (1997), an older group of 4-H members' learning styles was identified. The average GEFT for the 71 youth in the study was 10.41 (SD=5.26). This closely parallels the 10.16 GEFT score for 4-H county faculty identified in this study (SD=4.12). However, for most client groups, learning styles is an unknown. In addition, there is a need to identify the learning styles of the thousands of volunteers involved in extension programming in the state. Volunteers serve as the 'front-line' force in most of our programs associated with youth, many of our nutrition programs, and many of our environmental horticulture programs.

When faced with audiences that are highly field independent, county faculty need to work towards getting to the 'meat' of the subject matter. In addition, time for individual problem solving needs to be built into their program. County faculty should encourage field independent learners to apply their own problems to the subject matter. They should also provide corrective feedback, and be assertive in responding to client answers to questions that are incorrect. Finally, when working with field independent audiences, they should keep in mind that organization and structure of subject matter is essential. They should use caution in not getting sidetracked by questions when presenting programs.

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Differences in Learning Styles Of County Extension Faculty in Florida Based upon Selected Personal and Organizational Characteristics

A Critique

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Learning styles research has the potential for significant impact in agricultural education. This is a well written paper which described the learning styles of Florida Extension personnel across selected personal variables.

The paper clearly established the underlying theoretical framework for the problem under study. However, several questions arise as one reads the paper. The population under study consisted of 250 county extension personnel in 67 counties in Florida. The paper reported that a sample of 197 subjects from 54 counties was included in the study. How were the participants selected? How was a sample size of 197 from 250 determined? Why would the researchers draw a sample of nearly 80 percent of the population rather than including the additional 53 members of the population?

While the reliability procedures and coefficients, and the procedures for determining validity of the GEFT have been determined by the instrument developers, each should have been mentioned in this paper to allow the readers to determine the appropriateness of each for themselves.

The style of reporting some of the conclusions drawn from the data left this reader somewhat confused. If a test of differences between mean scores yielded no statistical differences, how can it be reported that a particular group "scored slightly higher" than another? Further, it is difficult to accept the cause-effect logic implied in a statement such as, "location of county faculty did not influence GEFT scores...." If one accepted the logic that the location of the county in which one chose employment as an adult affected one's learning style, would moving faculty from one county to another change their learning style?

The Conclusions section of the paper was a restatement of the findings, with no conclusions drawn, but for one exception. The authors concluded that future researchers should explore differences in learning styles based on such factors as intelligence, experiences, motivation, and personality traits. The reader is left to wonder why, since the findings of the study do not relate to these factors.

Based on the voluminous research on learning styles in agricultural education, which to date has sought little more than detailed description of each conceivable sub-group of clients, isn't it time to move beyond descriptive studies to developing and testing practices to improve education?

Effects Of Teaching Approach On Subject Matter Retention Across Learning Styles

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Introduction/Theoretical Framework

The teaching approach used by educators is very important to the success of the learning process. With the onset of the MTV era, teachers have found themselves in daily competition with professional entertainers to motivate and hold students' interest. As a result, students have come to expect that classes and classrooms be more student-centered and that teachers employ varying teaching techniques, methods, and/or approaches to accomplish their educational objectives. Since no one method of instruction will work all of the time and under every circumstance (Bartz & Miller, 1991), teachers should master several different teaching approaches and strategies (Joyce & Harootunian, 1967). According to Joyce and Weil (1986) teachers should select appropriate teaching methods based upon the learning styles of those being taught.

For the past three-quarters of a century one teaching approach has been recommended by agricultural educators as the one best method of teaching agriculture (Phipps & Osborne, 1988). Today, that approach remains the primary method of teaching offered to pre-service agriculture teachers in many teacher education programs. However, some educators question its validity as a superior approach to instruction. Likewise, many teachers view the problem solving approach as archaic--tied to the farm backgrounds and supervised agricultural experience programs of the learners (Moore & Moore, 1984). Critics of the problem solving approach also accuse that while the approach has a sound theoretical base, it has been accepted with very little empirical evidence to either defend or reject its usefulness in the classroom. Reviews of literature from prior studies have produced little evidence to refute this claim.

Ronning, McCurdy, and Ballinger (1984) reported that some students may possess a style of learning which is not complimentary to the use of problem solving instruction. Their incapacity to solve problems interacts with their inability to use past knowledge and experiences to arrive at a solution to the problem being studied. Dyer (1995) noted that field-dependent learners are among this category of learners, unable to recognize problems as such when presented with them. By contrast, field-independent learners routinely organize learning into problems to be solved. Field-neutral learners, however, benefit from the organization provided by problem solving instruction and experience higher levels of achievement if taught using the problem solving approach (Dyer). Canfield and Canfield (1976) suggested that research on learning and teaching styles serve as the basis for selecting appropriate teaching approaches to best address varying learning styles.

The theoretical framework for this study was provided by Mitzel's "Conceptual Model for the Study of Classroom Teaching," as adapted by Dunkin and Biddle (1974). Mitzel contended that changes in product variables (short-term and long-term retention) result from the combined effects of those things which students bring to the setting (context variables), those which teachers bring (presage variables), and those which occur in the classroom (process variables). Adapted to this study, the model suggests that the effectiveness of a teaching approach (process variable) on the short- and long-term retention of subject matter (product variables) by students is moderated by the learning styles (context variable) of those students when teacher effects (presage variables) are held constant. According to Flowers (1986), researchers must address each of the model's variables in studies involving classroom teaching. Therefore, consideration of the moderating effects of student learning styles is a necessity in determining the effectiveness of a teaching approach on the short- and long-term retention of subject matter by students.

A review of literature revealed only one study that addressed these variables in measuring the effects of the problem solving approach on short-term subject matter retention by secondary agricultural education students. Flowers (1986) reported no significant differences in short-term retention when the problem solving approach was compared to the subject matter approach. Flowers did note, however, that the problem solving approach proved significantly more effective in reducing achievement loss. No study could be found which addressed the effects of the problem solving approach on long-term retention of subject matter by secondary agricultural education students.

When student learning styles were introduced as a variable, no study could be found which measured the effects of student learning styles on either the short- or long-term retention of subject matter by secondary agricultural education students taught in classes using the problem solving approach. Clearly, a need existed to determine the effects of the problem solving approach on both the short- and long-term retention of subject matter in students of all learning styles.

Purpose and Objectives

The primary purpose of this study was to compare the retentive effectiveness of the problem solving approach to the subject matter approach in teaching given agricultural education problem areas to students with varying learning styles. The specific objectives of the research, stated as research questions, were as follows:

1. What were the effects of the problem solving and subject matter approaches on the short-term retention of subject matter by high school agricultural education students in Illinois?

2. What were the effects of the problem solving and subject matter approaches on the long-term retention of subject matter by high school agricultural education students in Illinois?

3. What were the effects of students' individual learning styles on the short-term retention of subject matter by students taught using problem solving and subject matter approaches?

4. What were the effects of students' individual learning styles on the long-term retention of subject matter by students taught using problem solving and subject matter approaches?

For purpose of statistical analysis, research questions were posed as null hypotheses. Each hypothesis was tested at the .05 level of significance. The null hypotheses tested in this study are as follows:

HO_1: There is no difference in the short-term retention of subject matter by students taught by the problem solving approach and the short-term retention of subject matter by students taught by the subject matter approach.

HO_2: There is no difference in the long-term retention of subject matter by students taught by the problem solving approach and the long-term retention of subject matter by students taught by the subject matter approach.

HO_3: There is no difference in the short-term retention of subject matter across learning styles of students when taught using either the problem solving or subject matter approach.

HO_4: There is no difference in the long-term retention of subject matter across learning styles of students when taught using either the problem solving or subject matter approach.

Procedures

Teachers were selected from the 311 agricultural education departments listed in the 1994-95 Annual Directory (Illinois Association of Vocational Agriculture Teachers, 1994) based upon their ability to use both the problem solving and subject matter approaches. The level of proficiency of the teachers to use the two approaches was determined from interviews conducted with University of Illinois Agricultural Education staff members, members of the Facilitating Coordination in Agricultural Education (FCAE) staff, and the teachers themselves. Once identified, teachers and their programs were visited by the researcher, and participation confirmed. Since random selection and assignment of teachers and students was an impossibility, it was believed that the best measurement of treatment effects could be attained by purposively selecting teachers who were capable of demonstrating both teaching approaches and randomly assigning treatments to intact classes.

Student enrollment numbers were obtained from participating teachers so that adequate numbers of students were available to conduct the study using the above criteria. Once selected, classes were randomly assigned to either the problem solving approach or the subject matter approach by coin toss. The study followed a variation of the nonequivalent control group design described by Campbell and Stanley (1963), but differed in that the subject matter approach to instruction was used as the control.

Six teachers and 16 classes with an enrollment of 258 students were selected to participate in the study using a cluster sampling technique. Both Flowers (1986) and Boone (1988) reported mortality rates ranging from 50-100% in their respective earlier studies examining the effects of the two approaches on achievement. The high rates were largely due to teachers' inability to correctly use each approach or in their inability to separate the two approaches, resulting in elevated mortality rates. To compensate for the expected loss of students, Hays' (1973) formula for determining sample size was used with a mortality allowance of 50%.

To control for existing knowledge of subject matter, students were administered a pretest in each unit of instruction. To statistically control for differing ability levels of students, normal curve equivalent (NCE) scores were obtained from guidance counselors and treated as covariates.

One treatment group received instruction in classes taught by the problem solving approach, the other group received instruction in classes taught by the subject matter approach. To control for teacher differences, each instructor taught one class using the problem solving approach and another using the subject matter approach.

Two units of instruction were taught to each group: "Applying Principles of Plant Science" and "Germinating Seeds." At the conclusion of all instruction, the Group Embedded Figures Test (GEFT) was completed by all participants and a multiple choice test administered to measure differences in achievement levels. Approximately two weeks later a parallel achievement test was administered to measure differences in short-term retention. Students completed a second retention test approximately five months later to measure differences in long-term retention.

Instructional units were prepared using the problem solving approach model presented in Newcomb, McCracken, and Warmbrod (1993) and the subject matter approach model described by Rosenshine and Stevens (1986). To ensure that instructors could effectively use each teaching approach, all instructors were provided inservice workshops ranging from 2-6 hours in length. To verify that instructors had adhered to the assigned treatment, all class sessions were audio recorded and analyzed using a 10-point researcher-developed analysis instrument. The instrument was evaluated for construct validity by university agricultural education staff members and inter-rater reliability established at $r = .95$.

All instruments were pilot tested and appropriately adjusted. The face, content, and construct validity of all researcher-constructed tests were determined prior to administration. Kuder-Richardson 20 reliability coefficients ranged from .77 to .92. The validity of the GEFT instrument was established and reported by Witkin, Oltman, Raskin, and Karp (1971) based on its parent test, the Embedded Figures Test. Witkin et al. reported a Spearman-Brown reliability coefficient of .82.

Hypotheses were tested using multivariate analysis of covariance (MANCOVA). Hotelling's $\underline{T}^2$ was calculated for the effects of the treatment (teaching approach), effects of student learning style, and interaction effects of the treatment and student learning styles on the dependent variables (short-term retention, long-term retention). In addition, other measures of variance and central tendency were used in analyzing data.

Results

Four of the six teachers correctly completed the study. It was determined from an analysis of audio tapes that one teacher had blended approaches (centered instruction in both treatment groups around solvable problems), whereas a second teacher failed to audio-record each class session. Data from 112 students in 12 classes were analyzed. Of these, 60 students were in classes using the problem solving approach whereas 52 students were in the subject matter approach treatment groups.

The mean class time needed to complete instructional units was 18.2 periods for the problem solving approach (range = 16 - 22) and 17.8 classes for the subject matter approach (range = 15 - 21). The majority of students who completed the study were male (65.2%) and Caucasian (97.3%). The majority of learners were field-independent (54.5%). Thirty-four students possessed field-dependent learning styles. Seventeen students were field-neutral learners (Table 1). Teachers who completed the study had GEFT scores of 12, 13, 17, and 17.

Table 1
Numbers and Percentages of Student Learning Styles by Teaching Approach

			Teaching Approach			
	Total		PSA		SMA	
Learning Style	n	%	n	%	n	%
Field-dependent	34	30.4	18	30.0	16	30.8
Field-neutral	17	15.1	8	13.3	9	17.3
Field-independent	61	54.5	34	56.7	27	51.9

Note. PSA = Problem Solving Approach, SMA = Subject Matter Approach.

A total of 73 male students and 39 female students completed the study. A majority of male students were field-independent learners. Likewise, the largest category of female students was also field-independent learners, though not a majority (Table 2).

Table 2
Numbers and Percentages of Student Learning Styles by Gender

	Gender			
	Male		Female	
Learning Style	n	%	n	%
Field-Dependent	21	28.8	13	33.3
Field-Neutral	10	13.7	7	17.9
Field-Independent	42	57.5	19	48.8

As indicated in Table 3, students in classes assigned to problem solving approach groups entered the study with higher ability (NCE) scores and greater pre-treatment knowledge of the subject matter, as exhibited by higher pretest scores. Covariate adjustments using NCE scores and pretests for each of the two units of instruction were made in group mean scores to control for these initial between-group differences.

Table 3
Mean Covariate Scores by Teaching Approach

	PSA (n = 60)		SMA (n = 52)	
Covariate	M	SD	M	SD
NCE	62.18	16.60	55.31	18.45
Pretest – Unit I	58.95	12.43	53.27	12.60
Pretest – Unit II	58.83	14.34	53.69	14.03

Note. PSA = Problem Solving Approach, SMA = Subject Matter

Approach.Hypotheses One and Two

Students in classes taught by the problem solving approach exhibited higher observed mean scores on both short- and long-term retention tests for the problem area which generated real and identifiable problems (Unit II). However, when those scores were adjusted for student ability level and prior knowledge, means were found to be similar (Table 4).

Table 4
Observed and Adjusted Mean Scores by Teaching Approach

	Observed Means		Adjusted Means	
Instrument	PSA	SMA	PSA	SMA
Short-term Retention Test I	72.85	72.93	71.46	74.32
Short-term Retention Test II	67.24	62.64	65.43	64.44
Long-term Retention Test I	67.51	65.14	66.34	66.25
Long-term Retention Test II	65.36	59.04	63.67	60.73

Note. PSA = Problem Solving Approach, SMA = Subject Matter Approach.

Hotelling's T^2 statistic was .038 ($p = .436$) for the effects of teaching approach on the dependent variables, indicating no significant differences at the .05 alpha level in either the short- or long-term retention of subject matter by students in classes taught by either the problem solving or subject matter approaches. As a result, neither null hypothesis one nor hypothesis two were rejected.

Hypotheses Three and Four

Effects of learning style.

Field-independent learners exhibited higher observed mean scores on both the short-term and long-term retention tests than did field-neutral or field-dependent learners, regardless of the teaching approach used. However, field-independent learners possessed higher ability levels than did either field-neutral or field-dependent learners (Table 5).

Table 5
Mean NCE Scores Across Learning Styles

Learning Style	n	M	SD
Field-dependent	35	52.17	18.04
Field-neutral	18	54.72	18.33
Field-independent	61	63.95	15.28

The coefficient of determination using Pearson's product-moment revealed a moderate, positive relationship ($r = .30$) between learning styles and NCE scores. As a result, when scores were adjusted for student ability level and prior knowledge, means were found to be similar across learning styles for both teaching approaches (Table 6).

Table 6
Observed and Adjusted Mean Scores by Teaching Approach and Learning Style

	Field-dependent		Field-neutral		Field-independent	
Instrument	Obs. Mean	Adj. Mean	Obs. Mean	Adj. Mean	Obs. Mean	Adj. Mean
Short-term Retention Test I						
PSA	72.83	75.07	66.25	69.20	79.47	74.28
SMA	67.17	70.16	73.33	73.49	77.59	75.15
Short-term Retention Test II						
PSA	65.72	68.42	64.37	67.28	71.62	66.00
SMA	56.69	59.22	62.44	63.99	68.78	64.70
Long-term Retention Test I						
PSA	64.33	66.23	64.62	66.72	73.56	69.56
SMA	59.19	61.58	67.33	66.61	68.89	67.22
Long-term Retention Test II						
PSA	63.17	65.25	63.62	66.34	69.29	64.49
SMA	58.94	62.38	52.22	53.10	65.96	61.64

Note. PSA = Problem Solving Approach, SMA = Subject Matter Approach.

To determine if significant differences existed between the treatment groups across learning styles, a multivariate analysis of covariance was performed, testing the effects of learning style on the dependent variables and the interaction effects of learning style by treatment. Hotelling's T^2 statistic was .074 for the effects of learning style on the dependent variables, which was not significant at the .05 alpha level ($p = .504$). Therefore, no significant differences based upon student learning style were found between the treatment groups when the dependent variables were considered simultaneously.

Interaction effects.

Hotelling's T^2 statistic was .087 for the effects of the interaction on the dependent variables of student learning styles and the teaching approach used, which was not significant at the .05 alpha level ($p = .379$). As a result, neither null hypothesis three nor hypothesis four were rejected.

Conclusions, Recommendations, and Implications

For all clinical studies care should be taken in generalizing findings to the target population. With this limitation in mind, and based upon the findings of this study, the following conclusions, recommendations, and implications were made.

The problem solving approach is neither more nor less effective than the subject matter approach in producing higher short-term retention scores. This finding agreed with that of Flowers (1986). Likewise, the problem solving approach is neither more nor less effective than the subject matter approach in producing higher long-term retention scores. This is a new finding which has neither been supported nor rejected by prior research. If the purpose of instruction is to increase retention scores, teachers may use either the problem solving or subject matter approach with equal effectiveness.

Student learning styles do not influence the effectiveness of either the problem solving or subject matter approaches in producing higher short-term or long-term retention scores for high school agricultural education students. However, given the moderate correlation between students' learning styles and NCE scores, and the finding that field-independent learners possessed higher ability levels (NCE scores) than did either field-neutral or field-dependent learners, further research addressing this phenomenon is warranted.

Subsequent studies should seek to determine the empirical relationship of GEFT scores to short- and long-term retention. For example, do students of differing learning styles differ in their ability to recall information? If so, what are the implications for classroom instruction?

As a clinical study, this research is severely limited in its ability to be generalized to other populations. The study should be replicated to increase the level of generalizability and to validate this piece of research.

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Effects of Teaching Approach On Subject Matter Retention Across Learning Styles

A Critique

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Experimental research designs have not been the hallmark of research in agricultural education. The majority of research in the profession historically has been aimed at mere description rather than the manipulation of variables to create new models of phenomena in agricultural education. Experimentation is all too infrequent. Therefore, any reasonable attempt at utilizing experimental designs should be applauded.

This well written paper summarizes an admirable attempt at field-based experimentation in social science research. Although the design is subject to a number of limitations associated with field-based manipulation of human subjects, the authors are to be commended and encouraged for their work at addressing each.

While the nonequivalent control group design poses some threats to the validity of the findings, the authors do an excellent job of attempting to account for these sources of error. The standardization of instructional approaches for each of the treatments across the various instructors, the use of a comparison treatment group, the random assignment of treatments to intact groups, and the use of a proxy for student ability as a covariate all represent complex considerations in implementing the research design. They also represent the researchers' serious attempt to produce valid results – to get it right.

Some questions do arise from the paper. An explanation of the scale for the GEFT would have been helpful to the reader. For example, obtained GEFT scores of the teachers are presented but not explained. It is reported that a majority of students, by gender, are field-independent, but no scores are given. Further, both the reported teacher scores and gender of students appear to be irrelevant to the report.

The Pearson product-moment correlation coefficient is presented for learning styles by student ability scores. Assuming that Pearson, which is intended for interval (or above) data, is the appropriate statistic to use on the GEFT, it appears that the GEFT explains only some 9 percent of the variance in the students' ability scores. Further, the report concluded that student learning styles do not influence the effectiveness of either method of teaching and learning under study. Shouldn't this relegate the study of learning styles to the "who cares?" dust bin of research in agricultural education?

Learning Styles of Navajo Students Enrolled in Secondary Agricultural Education

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Introduction

Demographic changes in the U.S. population are accelerating at a rapid pace. Banks (1991) asserted that the growth rate in the nation's population of people of color continues to outpace the growth of the nation's White population. Banks postulated that by the year 2020, students of color will make up about 46% of the nation's school-age youths.

Once known as the "vanishing Americans," the American Indian population has increased at every Census count since 1940 (Banks, 1991). During 1994, the American Indian population (including Alaskan Natives) grew by 1.5 percent from the 1990 Census, while the White population only grew by .8 percent (Bureau of Census, 1995). In 1990, more than one-half of the American Indian population lived in six western States (Oklahoma, California, Arizona, New Mexico, Alaska, and Washington) (Hodgkinson, 1992).

Major changes in American Indian education have occurred in the past two decades. Tharp and Yamauchi (1994) stated that 85-90% of American Indians are educated in the public school and the remaining 15-10% are educated in schools operated under private contract or by the Bureau of Indian Affairs. They also stated that American Indian students, as a group, are not succeeding in these schools. In 1990, 66 percent of the 1,080,000 American Indians 25 years and older were high school graduates or higher. This figure was reported to be below the total U.S. population (75 percent) (Bureau of Census, 1995). Of those students who stayed in school, they had a greater possibility of being labeled learning disabled or handicapped than students of other ethnic groups (Tharp & Yamauchi, 1994).

These statistics are not only of national concern, but also a concern for agricultural education. With a growing American Indian population, agriculture education teachers must be posed to provide effective education. According to Baruth and Manning (1992), effective education for American Indian learners requires consideration of each individual's learning style. Learning style has been described as "consisting of distinctive behaviors which serve as indicators of how a persons learns from and adapts to his/her environment" (Gregorc, 1979, p. 234).

More (1987) indicated that research and teacher data indicate that important differences in learning style between students and their non-Indian counterparts are often observed. According to Lesser (1976, p. 137), "people who share a common cultural background will also share, to a certain extent, common patterns of intellectual abilities, thinking styles and interests."

Related Literature

A number of authors (Swisher & Deyhle, 1987; Kaulbach, 1984; More, 1987; Baruth & Manning, 1992) have compared American Indian learners and Caucasion learners. On the basis of their literature reveiw, Swisher and Deyhle (1987) concluded that American Indian learners have strong visual perceptions and learn most effectively through observation, watching, and modeling. Kaulbach (1984) summarized studies on the performance of American Indian learners on visual, auditory, and kinesthetic perceptual tasks. He concluded that American Indian learners are most successful at processing visual information and have the most difficulty with auditory perception.

Baruth and Manning (1992) described the American Indian learning style as preferring to learning using visual/perceptual/spatial information rather than verbal means; using mental images to remember or understand words and concepts rather than word associations; and with strengths in processing information in a global/analytic manner (e.g., they focus on the whole rather than the part).

Similarly, More (1987) examined and synthesized research on American Indian learning styles in four areas: (1) Internal Cognitive Process; (2) External Conditions; (3) Teaching and Communication Styles; and (4) Traditional Learning Styles. He concluded that American Indian learners have: a) a higher frequency and relative strength in global processing on both verbal and non-verbal tasks; b) relative strength in simultaneous processing, but a possibility that sequential processing abilities develop much slower than simultaneous skills because they are not used as the primary grades; c) the possibility of using strengths in simultaneous processing to develop sequential processing; d) a higher frequency and strength in processing visual/spatial information; e) a higher frequency and relative strength in using imagery for coding and understanding; f) a lower frequency and relative weakness in verbal coding and understanding; and g) relatively more impulsive (or watch-then-do rather than trial-and-error) (p. 24).

Learning styles differences maybe attributed to the cultural and early socialization experiences by American Indian learners (Swisher, 1991). Guilmet (1979) attempted to explain the quiet nature of American Indian learners from a cultural perspective. He stated that the learning style of American Indian learners is to be silent in school because they were taught to be this way at home and in their community. Their social structure stresses learning through non-verbal mechanisms such as observation. From this socialization, American Indian learners bring this learning style with them into the classroom.

In agricultural education, much research has been conducted on learning style. The majority of this research has focused predominately on preservice teacher education (Cano, Garton, & Raven, 1992; Raven, Cano, and Shelhamer, 1993; Cano & Garton, 1994; Whittington & Raven, 1995), and secondary education students (Cox, Sproles, & Sproles, 1988; Marrison & Frick, 1994; Cox & Connors, 1996; Garton, Thompson, & Cano, 1996). While these studies have provided a better understanding of students' learning styles in agricultural education, no research has been identified that investigate the learning style of American Indian learners enrolled in secondary agricultural education. In his review of American Indian learning style literature, More (1987) concluded that while differences do exist between American Indian and non-American Indian learners, they "are not consistent enough to suggest a unique Indian learning style, but occur often enough to warrant careful attention" (p. 17).

Purpose and Objectives

The purpose of the study was to assess the learning style and traditionalism of American Indian learners. The specific objectives of the study were:

1. To describe the personal characteristics and traditionalism of American Indian learners.
2. To assess the learning style of American Indian learners.
3. To determine if differences exist between American Indian learners' gender and learning style.
4. To determine if differences exist between American Indian learners' traditionalism and learning style.

Method/Procedures

Subject Selection

A descriptive research design was used in the study. The target population was American Indian learners enrolled in secondary agricultural education programs. The assessable population was American Indian learners enrolled in agricultural education at Tohatchi High School during the spring semester of 1997. Tohatchi High School is a public institution located on the Navajo reservation which extends across the New Mexico and Arizona state line. The program consisted of four (4) agricultural education classes. The class roster served as the frame for the study. All Diné (Navajo) students enrolled in the agricultural education program were selected for the study (N=78).

Instrumentation

Two data collection instruments were used in completing the objectives of the study. The Group Embedded Figures Test (GEFT), developed by Oltman, Raskin, and Witkin (1971), and a researcher developed instrument served to gather the data. The GEFT was used to assess the learning style of the subjects using a continuum approach to determine field independence or field dependence. Field independence is measured by the degree to which individuals can separate a figure from its background, a part of the whole, or oneself from the environment and other people. Field independent persons are analytic, dislike rigid systematization and routines, and engages in active, participant approaches to learning. Conversely, field dependent persons are less able to separate each part of from the whole, engage in spectator approaches to learning, are intuitive and attentive to social cues, and often are described as emotionally receptive (Dunn & Griggs, 1995). It is important to note that the characteristics of field independence/dependence describe the extreme ends of the continuum and persons falling along the continuum may possess characteristics of both a field independent and field dependent learner. Persons can be scored from 0 to 18 on the GEFT. Persons scoring below the national mean of 11.4 were categorized as field dependent learners, and person scoring above the national mean were categorized as field independent learners (Witkin et al., 1971).

The GEFT is a standardized test and has be assessed for validity by its developers (Witkin, Oltman, Raskin, & Karp, 1971). The reliability of the GEFT was measured by treating each scored section of the test as split halves. Witkin et al. (1971) reported a corrected Spearman-Brown coefficient of .82 as an estimate for reliability for males and females combined.

The second instrument was used to gather personal characteristics and traditionalism data from the subjects. Characteristic data gathered included age, gender, number of siblings, and current grade level. Traditionalism data was gathered using a series of questions related to the topic. Traditionalism was operationally defined as the use or non-use of the Athapaskan language, more commonly known as "Navajo", alliance with grandparent(s), and participation in traditional ceremonies. The instrument was assessed for face and content validity by a panel considered to be well versed in instrument development. Because the students' characteristics were considered to be stable, reliability estimates were not calculated on this instrument. The questionnaire was formatted according the suggestions provided by Dillman (1978).

Data Collection

Arrangements for data collection were made with the proper authorities at Tohatchi High School a priori. The data was collected on a Thursday, February 27, 1997. Careful consideration for this date was given to avoid absenteeism, holidays, and/or special school events. All data was collected on-site by one of the researchers.

During the administration process, each class of students were first given a brief explanation of the purpose of the study and assurance of confidentiality. Ensuing the explanation, the GEFT was administered following the strict guidelines provided by the developers (Oltman, Raskin, and Witkin, 1971). After students completed the GEFT, students were asked to respond to the questionnaire provided. The researcher and the agriculture education teacher remained in the classroom during the data collection to assist students when needed and to ensure the integrity of the data gathered.

At the end of the data collection period, data was gathered from 62 subjects yielding a 80% response rate. Non-respondent error was attributed to absenteeism of students. No effort was made to control non-response error, thus the data hold true only for those who responded.

Data Analysis

Data were analyzed using SPSS/pc Windows Version. Frequencies, percentages, and measures of central tendencies and variance were reported. Because the subjects in the study did not comprise a probablistic sample, no effort was or should be made to extrapolate the findings.

Results/Findings

Characteristics of students enrolled in Tohatchi High School agricultural education program are presented in Table 1. Characteristic data included age, gender, number of siblings and high school grade level. It was found that the average age for subjects was 16.8 with a standard deviation of 1.2. Male students accounted for 80.6 percent (n=50) of the subjects, while 19.4 percent (n=12) were female. Approximately 95 percent of the students reported having one or more siblings. Of those who reported having a sibling (n=59), approximately 66 percent has one to four siblings, where, twenty-nine percent of the subjects had reported having more that four siblings. With regard to grade level of the students, 8.1 percent (n=5) were Freshmen, 21.0 percent (n=13) were Sophomores, 33.9 percent (n=21) were Juniors, and 37.1 percent (n=23) were Seniors.

Table 1.
Characteristics of Students Enrolled in THS Agricultural Education Program (n=62)

Variable	F	P	M	SD
Age			16.8	1.2
Gender				
Male	50	80.6		
Female	12	19.4		
No. of Siblings				
None	3	4.8		
One	6	9.7		
Two	8	12.9		
Three	11	17.7		
Four	16	25.8		
More than four	18	29.0		
High School Grade Level				
Freshmen	5	8.1		
Sophomore	13	21.0		
Junior	21	33.9		
Senior	23	37.1		

Traditionalism was measured using series of questions that probed the students' home environment. Students' use or non-use of their native language, their association with the grandparent(s), and practice of traditional Navajo ceremonies were used as proxies to traditionalism. If students responded "Yes" to the questions, they were considered to exhibit traditionalism. Table 2 presents the items associated with traditionalism. It was found that approximately 94 percent (n=58) of the students reported that their family speak Navajo at home, whereas only 37.1 percent (n=23) considered themselves fluent Navajo speakers.

With regards to friends and school, a relatively small percent (15.8%; n=9) indicated they speak fluent Navajo with their friends and at school. However, with questioned whether or not their family's follow traditional Navajo beliefs, the majority (72.6%; n=45) of the students reported doing so. Similarly, 71 percent (n=44) of the students indicated their family actively participate in traditional Navajo ceremonies.

When questioned about their alliance with their grandparent(s), approximately 36 percent (n=22) of the students reported that their grandparent(s) lives with their immediate family. Additionally, the majority (75.8%; n=47) of the students reported to spend time with their grandparent(s).

Table 2.

Traditionalism of Students Enrolled in THS Agricultural Education Program (n=62)

Item	Yes	P	No	P
Family speak Navajo at home	58	93.5	4	6.5
Speak fluent Navajo	23	37.1	39	62.9
Speak fluent Navajo with friends*	9	15.8	49	84.5
Speak fluent Navajo at school*	9	15.8	48	84.2
Family follow Navajo beliefs	45	72.6	17	27.4
Family actively participate in Navajo ceremonies	44	71.0	18	29.0
Grandparent(s) live in household	22	35.5	40	64.5
Spend time with grandparent(s)	47	75.8	15	24.2

Note. *Frequency reflects missing data.

The GEFT was used to assess students' learning style (Table 3). Students scoring greater than the national mean of 11.4 were said to possess field independent characteristics, whereas those scoring below the national mean were said to possess field dependent characteristics (Witkin et al., 1971).

Table 3.

Learning Style of Students Enrolled in THS Agricultural Education Program (n=62)

	Learning Style			
Gender	Field Dependence		Field Independence	
	F	P	F	P
Male	12	24	38	76
Female	6	50	6	50
All Students	18	29	44	71

Note. Mean=13.3; Std. Dev. 3.8; Range=0 to 18

It was found that, in general, students tended to be more field independent (M=13.3; SD=3.8) (Table 3). Individual learning styles scores ranged from 0 to 18. Additionally, it was found that 24 percent (n=12) of the males were field dependent, while the majority (76%; n=38) were field independent. Learning style scores for males ranged from 2 to 18. Conversely, females comprised both field dependence (50%; n=6) and field independence (50%; n=6) equally. Learning style scores for females ranged from 0 to 17. Comparatively, male students (M =13.8) tended to be more field independent than their female (M =11.4) counterparts (Table 4).

With respect to traditionalism, students' whose family do not speak Navajo (M=15.2) at home tend to be relatively more field independent that students whose family do (M=13.2) speak Navajo at home (Table 4). Students who do not speak fluent Navajo (M=13.5) tend to be relatively more field independent then students who do speak fluent Navajo (M=12.9). However, students who speak Navajo with their friends (M=14.6) tend to be relatively more field independent then those who do not (M=13.4). Similarly, students who speak Navajo at school (M=14.9) tend to be relatively more field independent then those who do not (M=13.4).

Regardless of whether or not students' family follow traditional Navajo beliefs or participate in traditional Navajo ceremonies, students tended to be field independent (Table 4). Similarly, students tended to be field independent whether or not students grandparent(s) resided in the students' home. However, students who did not spent time with their grandparent(s) (M=14.1) tended to be relatively more field independent than student who did (M=13.1).

Table 4.

Students' Learning Style by Gender and Traditionalism (n=62)

Variable	F	M	SD	Range
Gender				
Male	50	13.8	3.29	2 to 18
Female	12	11.4	5.24	0 to 17
Family speak Navajo at home				
Yes	58	13.2	3.84	0 to 18
No	4	15.2	3.59	10 to 18
Speak fluent Navajo				
Yes	23	12.9	4.12	2 to 18
No	39	13.5	3.68	0 to 18
Speak fluent Navajo with friends*				
Yes	9	14.6	2.92	10 to 18
No	49	13.4	3.52	2 to 18
Speak fluent Navajo at school*				
Yes	9	14.9	3.02	10 to 18
No	48	13.3	3.52	2 to 18
Family follow traditional Navajo beliefs				
Yes	45	13.2	4.01	0 to 18
No	17	13.8	3.27	8 to 18
Family actively participate in Navajo ceremonies				
Yes	44	13.3	4.08	0 to 18
No	18	13.6	3.24	8 to 18
Grandparent(s) live in household				
Yes	22	13.6	3.84	2 to 17
No	40	13.2	3.86	0 to 18
Spend time with grandparent(s)				
Yes	47	13.1	4.08	0 to 18
No	15	14.1	2.92	8 to 18

Note. *Frequency reflect missing data.

Conclusions/Recommendations/Implications

Based on the findings the following conclusions/recommendation and implications were made. Characteristically, it was concluded that students enrolled in Tohatchi High School agricultural education program tended to be male upper-classmen with the majority having four or more siblings.

Students, in general, were field independent. Given the related literature, this conclusion appears to be counter intuitive. One might hypothesize that American Indian learners would be field dependent because of their strong social structure. However, upon further consideration of the nature of the course of study in which students were enrolled, one must factor in the discipline of the course - agriculture. At Tohatchi High School, as with other schools, agricultural education courses are student electives. Witkin, Moore, Goodenough, and Cox (1977) noted that field independent learners tend to prefer mathematic and science-related disciplines. Thus, students will self-select themselves into a discipline which they would perceive to enjoy. In her study of Athapaskan and Algonquin Indian cultural groups, Weitz (1971) found the overall group were more field independent.

Categorically, male students were more field independent than female students. Weitz (1971) found that females were more field independent then males.

When considering the multitude of differences among American Indian people, Baruth and Manning (1992) warn that "to assume that all American Indian learners have similar learning styles shows a disregard for nations, tribes, and individuals, as well as educational and socioeconomic backgrounds" (p. 49). Swisher (1991) indicated that over generalization can contribute to 1) stereotypic notions about the relationship between learning style and cultural group membership; 2) discriminatory practices (e.g., inappropriate grouping); and 3) inappropriate excuses for failure in teaching and learning.

While a single index can not be calculated for traditionalism, one can conclude there are degrees of traditionalism exhibited by students. For example, items pertaining to family or grandparent(s), tend to reflect patterns of traditionalism. However, items pertaining more directly to student behaviors tend to reflect a removal from traditionalism. This would imply that students perceive their family to be traditional, but generally do not link themselves to the family's traditionalism.

While the items in the study selected to measure traditionalism do not represent the universe of items measuring traditionalism, they do provide a beginning for understanding how traditionalism influences learning style. With some exception, it was concluded that students who are less traditional tend to be relatively more field independent then those are traditional. The exceptions are students who speak fluent Navajo with friends and at school, and students whose grandparent(s) live in the household. This was contradictory to Weitz (1971), who found that traditional Athapaskan and Algonquin Indian cultural groups were more field independent.

It is recommended that educators at Tohatchi High School recognize the variation of student learning styles and degrees of traditionalism among students. Cox and Ramirez (1981) recommended that teachers use direct observation and classroom experiences for instruction that takes account of learning styles. They recommend 1) assessing students' preferred ways of learning and the way(s) in which students behaviors change from situation to situation; 2) planning learning experiences that incorporate the students' preferred ways of learning--using teaching methods, incentives, materials, and situations that are planned according to student preferences; 3) evaluating the learning experiences in terms of attainment of conceptual or other goals, as well as in terms of observed student behaviors and involvement; 4) as the year progresses, plan and implement student participation in learning experiences that require behaviors that the student has previously avoided; and 5) continue to provide familiar, comfortable, successful experiences, as well as to gradually introduce the student to learning in new ways (Cox & Ramirez, 1981).

Swisher and Deyhle (1989) provided more specific recommendations for teaching American Indian learners. They suggest 1) get to know the norms and values of the community; 2) be aware of the students' background knowledge and experiences; 3) discuss the students' learning styles with them and help them understand why they do what they do in learning situations, 4) be aware of the pacing of the activities within a time framework that may be rigid and inflexible; 5) be aware how questions are asked - think about the communication style of the students; 6) remember that some students do not like to be spotlighted in front of the group; 7) provide time for observation and practice before performance; and 8) provide feedback that is immediate, consistent, and private, if necessary.

It is recommended that further research be conducted on the learning style of students of color. As the nation's population of people of color continues to grow, agricultural education will see an increase in enrollment from this population. With this knowledge will come understanding. And, with understanding, appropriate adjustments can be made in the curriculum and delivery of instruction in agricultural education.

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Learning Styles of Navajo Students Enrolled in Secondary Agricultural Education

A Critique

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This paper does an excellent job of citing the literature to build a theoretical framework for the learning style portion of the study. However, it does not build theory for the inclusion of "traditionalism" as a major variable of interest. Further, a better description of the instrument used to assess traditionalism would have allowed the reader the opportunity to determine the extent to which reliability estimates were necessary (or unnecessary, as the authors note). It appears that measuring frequency of "participation in traditional ceremonies" may be a potential source of error and, therefore, may affect the reliability of the data.

In the Introduction, various data are presented with regard to the numbers of Native Americans in schools. However, no data are provided for the number of Navajo students in agricultural education programs, the phenomenon under study. While the former set of data may be of significant consequence, is the latter? Finally in the Introduction, the author cites More (1987) and concludes that, "... while differences do exist between Native American and non-Native American learners, they 'are not consistent enough to suggest a unique Indian learning style...'." One is left to wonder about the need for the study.

The discussion in the paper of the GEFT instrument to assess learning style does an excellent job of describing its usage. However, this reader has long wondered why the instrument developers automatically described one-half of the general population as field dependent and one-half as field independent. This determination seems arbitrary. Isn't it possible that 3/4 of the population could be field independent? Other than gender, few variables in the social sciences are dichotomous. How does dichotomizing a continuous variable produce new knowledge? Why don't researchers who use the instrument find new ways to interpret it?

The Conclusions and Recommendations section of the paper recommends that "educators ... recognize the variation of student learning styles and degrees of traditionalism among students" and endorses the recommendations by Cox and Ramirez (1981) and Swisher and Deyhle (1989). It provides no unique specific recommendations based on this data. In fact, upon review of those recommendations one wonders what makes them unique to the needs of Native American learners. They make sense for all learners. But, do educators really need a study of learning styles to know (for example) to "provide feedback that is immediate, consistent, and private," a well-documented professional practice?

Based on the voluminous research on learning styles in agricultural education, which to date has sought little more than detailed description of each conceivable sub-group of clients, isn't it time to move beyond descriptive studies to developing and testing practices to improve education?

The Relationship Between Learning Styles, Academic Major, and Academic Performance of College of Agriculture Students

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Introduction/Theoretical Framework

Seven years ago, the nation's leaders agreed on six national Goals for Education to be achieved by the year 2000. The six national goals were set to energize public opinion and ongoing educational reform efforts by holding educators accountable to much higher expectations for all students, schools, and the learning systems that served the students (National Education Goals Report, 1993). Along with higher expectations came increased accountability and challenges which educators faced when preparing students to meet the rigid testing standards recommended by the National Council on Educational Standards and Testing (NCEST).

Following the publication of the NCEST Report (1992), new efforts were launched at the national, state, and local levels to reach consensus on the content and knowledge students needed to master. Another important task recommended by NCEST was the creation of performance standards which would help in determining how good was "good enough" in learning subject matter content (National Education Goals Report, 1993).

After reviewing the NCEST Report (1992), the Goals Panel (1993) set higher educational performance standards for students. Why? Because the "expectations for student achievement have been disastrously low for all students, and these low expectations play a critical role in explaining our poor educational performance" (National Education Goals Report, 1993, p. 14). Do low expectations for academic achievement really play a critical role in poor educational performance, or are educators focusing on the easiest method of testing? Does the testing of how much a learner knows really assess our educational system's outcomes?

Beyer (1984) suggested there were at least two general flaws with testing. One flaw was that almost all tests were plagued with conceptual inadequacy. The second flaw was that tests typically measured discrete skills in isolation without students being given the opportunity to engage in sequences of cognitive operations. Beyer (1984) argued that commercial or teacher made tests using multiple-choice items could be the least useful way to measure students' thinking skills. Beyer (1984) concluded that danger existed in measuring student's performance solely on isolated thinking skills and assuming that those measures represented a students' critical thinking, problem solving processes, or other notable differences among students.

There is evidence to suggest that students differ greatly in how they learn (Dunn & Dunn, 1979; Bargar, Bargar, & Cano, 1994). Anderson and Adams (cited in Torres, 1993) stated that:

> One of the most significant challenges that university instructors face is to be tolerant and perceptive enough to recognize learning differences among their students. Many instructors do not realize that students vary in the way they process and understand information (p. 19).

Research suggests that learning style is an important factor in agriculture students' achievement (Cano & Garton, 1994). Learning style has been defined as "distinctive behaviors which serve as indicators of how a person learns and adapts to his/her environment. It [learning style] also gives clues as to how a person's mind operates" (Gregorc, 1979. p. 234). Garger and Guild (1984) defined a person's learning style as a stable and pervasive characteristic, "expressed through the interaction of one's behavior and personality as one approaches a learning task" (p. 11).

White (1970) confirmed there was a pattern of intellectual change which occurred in college students. Like the early childhood stages of development as described by Piaget, Perry (1970) indicated that a basic progression in ways of thinking for a student during the college experience existed. Perry (1970) further stated that this basic progression influenced the instructor and/or advisor of the student to seek alternative ways to teach and advise. White (1970) and Lyons (1979) encouraged teachers who hoped to nurture the importance of basic progression in the development of intellectual change, to practice their art with responsive versatility in an effort to retain more students.

In education today, there appears to be gaps in the area of communication, educational process, and content related to the retention of students. Therefore, what is needed is a bridge between that which is known about students, and the relationship between learning style and academic performance. Finding a bridge may shed some light on why college administrators are losing the battle on the attrition of students. College of agriculture administrators are reporting higher numbers of dismissals than in previous years. Can educators begin to lower the number of dismissals through a better understanding of learning styles?

The most extensively studied learning style dimension, with the broadest application to educational problems, has been that of field-dependence and field-independence (Garton, 1993; Torres, 1993). Researchers have generalized that field-independent students tend to approach learning tasks analytically, looking at pieces of the whole or particular aspects of a concept or idea, and often prefer to work alone. Field-dependent students tend to approach learning tasks globally, viewing ideas in a larger context. In addition, field-dependent students prefer small group work and discussion (Davis, 1993).

In past studies, there have been noted correlations in how a learner learns, measured by learning style, and how much a learner learns, measured by cumulative grade point average (Torres, 1993; Torres & Cano, 1993). Other findings indicated that students who were more independent in their thinking, were more successful in higher education (Porter & Cano, 1996). What implications does this hold for those students who are more field-dependent? Are field-dependent students as successful as their counterparts within higher education? For those educators who communicate, interact, and teach students daily, the knowledge gained from learning about the relationship between learning style and academic performance, can only help in the retention of students.

Purpose and Objectives

The purpose of this study was to describe the learning style and academic performance of 1994 incoming freshmen students enrolled in the College of Food, Agricultural, and Environmental Sciences at The Ohio State University. The study investigated the relationships between learning style, academic performance, and selected student characteristics. The specific objectives of the study were to:

1. describe the students' learning style within majors;
2. describe the relationship between students' learning style and academic performance; and,
3. describe the relationship between students' learning style and academic disciplinary action taken by the College.

Methods/Procedures

Population and Sample

The population for this longitudinal descriptive-correlational study was a census of all 1994 incoming freshmen students enrolled in the College of Food, Agricultural, and Environmental Sciences at The Ohio State University (N=187). The accessible population was those students attending a freshman orientation class in October, 1994. Results of the study were generalized only to the accessible sample (n=178).

Instrumentations

The Group Embedded Figures Test (GEFT), a valid and reliable instrument, was used to identify student learning style (Witkin, Oltman, Raskin, & Karp, 1971). Data collection for learning styles occurred in October, 1994. For the purpose of the study, a person's learning style was measured for field-dependence or field-independence. Learning style was determined by an individual's score on the GEFT ranging from 0 - 18. The learning style score of incoming freshmen was dichotomized as either field dependent (0 - 11) or field-independent (12 - 18) using the GEFT's national mean (11.3) as the separation point between field-dependence and field-independence. Student learning style scores above the mean were considered field-independent and student learning style scores at or below the mean were considered field-dependent (Witkin et al., 1971).

Data Collection

The GEFT was administered by a researcher qualified to administer the test following the established guidelines developed by Witkin, Oltman, Raskin, and Karp (1971). The GEFT was hand scored by the researcher who administered the test. After the GEFT was administered, the primary source for research data was the College of Food, Agricultural, and Environmental Sciences student database. Using a fact sheet, student data were collected from the student data base for major, ACT score, cumulative grade point average (CGPA), and disciplinary action taken. Academic disciplinary action occurs when a student grade point average (GPA) falls below a 2.00 and at the time deficiency points begin to accumulate. The primary data (from the student data base) were collected during the month of October, 1995, and October, 1996. Disciplinary action data was treated as nominal data.

Data Analysis

Data were analyzed using SPSS/PC for Windows software program. Davis' (1971) convention was used to describe relationships. Pearson Product Moment correlation coefficients were calculated between GEFT and ACT scores, GEFT and CGPA , and GEFT and Disciplinary Action. An alpha level of .05 was set a priori.

Results/Findings

An analysis of student learning style, using frequencies and percentages, by academic major (Table 1) indicated that 99 (56%) of the 1994 incoming freshmen were field-independent. Meanwhile, 79 (44%) of the 1994 incoming freshmen were field dependent. As this is a panel study (a sample is selected from the population at the initial data collection point and the same sample is used at each data collection point) (Miller, 1997), the percentage for field-dependence and field-independence cannot change. In 1995, the 1994 incoming freshmen who were field-independent most likely majored in Agribusiness and Applied Economics, Agronomy, Animal Sciences, or Horticulture. In 1996, the 1994 incoming freshmen who were field-independent most likely majored in Agricultural Education, Animal Sciences, Food Science, or Horticulture. The field-dependent students in 1995 were most likely to major in Agricultural Systems Management, Construction Systems Management, Other (includes majors outside the College of Agriculture or the subject is no longer a student at Ohio State University), or Undecided. In 1996, the students who were field-dependent most likely majored in Agribusiness and Applied Economics, Agricultural Communication, Agricultural Systems Management, Agronomy, Construction Systems Management, Other, or Undecided (Table 1).

Table 1. Learning Style and Academic Major of Students (n=178)

	1995				1996			
	Dependent		Independent		Dependent		Independent	
	n	%	n	%	n	%	n	%
Agbus & App Econ	12	46	14	54	14	52	13	48
Ag Comm	7	50	7	50	10	67	5	33
Ag Educ	9	50	9	50	7	32	15	68
Ag Sys Mgmt	2	67	1	33	2	67	1	33
Agron	6	46	7	54	8	57	6	43
An Sciences	25	36	45	64	18	34	43	66
Con Sys Mgmt 2	67	1	33	3	75	1	25	
Food Science	1	50	1	50	0	0	3	100
Hort	5	45	6	55	5	38	8	62
Other	1	100	0	0	9	75	3	25
Undecided	9	53	8	47	3	75	1	25
Total	79	44	99	56	79	44	99	56

The mean CGPA was 2.45 and was used to determine the two CGPA categories. Using frequencies and percentages, the CGPA score for academic performance indicated that in 1995, a total of 100 (56%) incoming freshmen (n= 178) were above a 2.46 CGPA and 78 (44%) were at or below a 2.45 CGPA. Of those students above the 2.46 CGPA, 66 (67%) were field-independent and 34 (43%) were field dependent in 1995. Meanwhile, the 1995 findings indicated that of those students at or below a 2.45 CGPA, 33 (33%) were field-independent and 45 (57%) were field-dependent (Table 2).

Using frequencies and percentages, the CGPA score for academic performance indicated that in 1996, a total of 105 (59%) 1994 incoming freshmen (n= 178) were above a 2.46 CGPA and 73 (41%) were at or below a 2.45 CGPA. Of those students above the 2.46 CGPA, 75 (71%) were field-independent and 30 (29%) were field dependent in 1996. Meanwhile, the 1996 findings indicated that of those students at or below a 2.45 CGPA, 22 (30%) were field-independent and 51 (70%) were field-dependent (Table 2). The CGPA results for both data collection years indicated that the majority of field dependent students were at or below a 2.45 CGPA, whereas, the majority of field independent students were above a 2.45 CGPA.

Table 2. Learning Style and College Grade Point Average (CGPA) (n=178)

	1995				1996			
	Dependent		Independent		Dependent		Independent	
Grade Point Average	n	%	n	%	n	%	n	%
2.46 - 4.00	34	34	66	66	30	29	75	71
0.00 - 2.45	45	58	33	42	51	70	22	30
Total	79	44	99	56	81	46	97	54

Mean = 2.45

The relationship between learning style and ACT scores were all positive and significant, ranging from low ® = .25) for ACT Reading, to substantial ® = .51) for ACT Math in the 1995 data collection year. As the ACT scores and learning style are constant, changes should not occur within the study. However, the CGPA is not constant, and therefore subject to change from year to year. In 1995, learning style correlated low, positive, and significant with CGPA ® = .24) (Table 3). In 1996, the relationship between learning style and CGPA was significant, moderate, and positive ® = .30) (Table 3). The positive relationships indicated that as learning style score increased, an increase was noted in ACT score and CGPA.

The correlations indicated low to negligible relationships between learning style and academic disciplinary action taken by the College for both data collection years (Table 4). A low positive relationship resulted between learning style and disciplinary action of none (1995, r =. 14; 1996, r = .16). All other disciplinary actions (special action probation, probation, warning, and dismissal) were low to negligible and negative, ranging from ® = -.02) to ® = -.23). The negative relationships indicated that as academic disciplinary action increases, learning style score decreased. The positive relationship indicated that as learning style score increased, academic disciplinary action decreased. A significant relationship ($p < .05$) between learning style and all disciplinary action taken by the College was indicated for both data collection years.

Table 3. Relationship Between Learning Style and ACT Score (n=178)

1995		1996	
English	.34*	English	.34*
Math	.51*	Math	.51*
Reading	.25*	Reading	.25*
Science	.38*	Science	.38*
Composite	.42*	Composite	.42*
CGPA	.24*	CGPA	.30*

*p < .05

Table 4. Relationship Between Learning Style and Academic Disciplinary Actions (n=178)

1995		1996	
None	.1 4*	None	.16*
Special Action Probation	-.02*	Special Action Probation	-.07*
Probation	-.17*	Probation	-.23*
Warning	-.07*	Warning	-.10*
Dismissal	-.03 *	Dismissal	-.21*

*p < .05

Conclusions/Recommendations/Implications

The learning style of the 1994 incoming freshmen enrolled in the College of Food, Agricultural, and Environmental Sciences at Ohio State University, tended to be leaning towards field-independent, but not in any practical terms. The mean GEFT score for the 1994 entering freshman was 11.6 which minimally exceeded the national mean of 11.3 (Witkin, Oltman, Raskin, & Karp, 1971).

Freshmen students in the study who were field-independent, in 1995, majored in Agribusiness and Applied Economics, Animal Sciences, Horticulture, or Agronomy. Furthermore, the results indicated that for the majors of Agricultural Communication, Agricultural Education, and Food Science, the students were evenly split between field-dependent and field-independent. The students majoring in Agricultural Systems Management and Construction Systems Management were field-dependent.

In 1996, however, the students who were field-independent tended to major in Agricultural Education, Animal Sciences, Food Science, or Horticulture. The 1996 results also indicated that the students who were field-dependent tended to major in Agribusiness and Applied Economics, Agricultural Communication, Agricultural Systems Management, Agronomy, Construction Systems Management, Other, and Undecided.

The results of the current study were similar to the results in a former study conducted by Torres (1993) which noted that the field-independent senior students majored in Animal Sciences, Horticulture, Agricultural Education, and Food Science. Torres (1993) also concluded that the senior students who were majoring in Agribusiness and Applied Economics and Agronomy were field-independent. The current study does not support those findings by Torres (1993).

If the trend continues between academic major and learning style, it is conceivable to conclude that those students who are attracted to "hard" science majors are field-independent students, and those attracted to "social" sciences are field-dependent students. However, one puzzling point to note is that Agronomy, generally considered a "hard" science, in the 1995 data of the current study and the Torres (1993) study, was favored by field-independent students. However, in the 1996 data of the current study, Agronomy was favored by field-dependent students. More investigation is warranted to discover the reasons leading to the inconsistency.

Furthermore, the students who majored in "Other," for both field-dependents and field-independents, increased at an alarming rate. The students in the "Other" category have either switched to majors outside the College, or are no longer students in the University, either by their choice or the College's choice. What is more alarming, is that the greatest proportion of the increase came from field-dependent students. What ever the case, more investigation is warranted to determine the "real" reasons the students changed majors or left the university.

Therefore, it is recommended that a qualitative study focusing on those students from the current study who changed majors from and within the College of Food, Agricultural and Environmental Sciences, or who are no longer students at Ohio State University be initiated immediately. The purpose of the qualitative study would be to determine the factors that influenced the student's decision to make a change, to learn if those factors are related to learning style, and to learn if the identified factors can be addressed by the College.

The results of the current study suggested field-dependent students were more likely to receive disciplinary action from the College due to a lower CGPA, than were field- independent students. The findings also indicated that as learning style score moved from dependent to independent, there were corresponding increases in ACT scores and CGPA. Since ACT score and CGPA are used as indicators of academic success, the findings tend to imply that field-independent students will be more successful in higher education.

Furthermore, based on the fact that as learning style moves from dependent to independent, CGPA and ACT scores increase, the findings in the current study also support the notion that as learning style moves from independent to dependent, the disciplinary action taken by the College increases. Again, the findings imply that the structure utilized in higher education is more supportive of field-independent students.

From previous research, it has long been known that CGPA and ACT scores were positively related; that is, as CGPA increased, ACT scores increased. The current study confirmed the previous research. In other studies by Kroon (1986), Hodges (1986), and Giannitti (1989), it was learned that academic achievement was positively influenced by learning style. The evidence in the current study is clear to indicate, that learning style does positively influence academic achievement in the College of Food, Agricultural, and Environmental Sciences. What could be the variables supporting this phenomenon? Is it the teaching conducted by the instructors?

Based on the premise that teachers teach the way they learn (Dunn & Dunn, 1979), a recommendation for further research would be to determine the learning style of faculty. This information could be used to see whether learning style influences methods of teaching students and also the relationship which may occur between the teachers' learning style and the students' academic achievement. In addition, a thorough investigation is warranted to determine the "actual" teaching methods utilized by the faculty in the College of Food, Agricultural, and Environmental Sciences at Ohio State University, and the impact or influence the teaching methods have on academic achievement.

In addition, the researchers recommend identifying students' learning styles early in their academic career. The purpose of identifying the students' learning style early in their academic career would be to alert the student to his or her academic weaknesses and to teach them mechanisms by which to cope and/or adapt their learning. It is also recommended that the College, knowing that field-dependent students are more likely to need academic assistance, should establish a "drop-in" lab for all students. The lab's function would be to provide tutoring, academic counseling, and seminars on surviving in college which would enhance their educational experience. By determining students' learning styles and helping educators communicate, interact, and teach more effectively to those styles, retention of students may be enhanced.

Other recommendations for the "drop -in" lab include: a) teaching advisers to learn their own learning styles and how it affects advising; b) teaching advisors how to identify and share with advisees the advisee's learning style; c) teaching and encouraging advisors to share with advisees the relationship between learning style and academic performance; and, d) teaching advisors how to more closely monitor their advisees' academic performance and choice of major given an awareness of the importance of learning styles.

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The Relationship Between Learning Styles, Academic Major, and Academic Performance of College of Agriculture Students

A Critique

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This study explores relationships between student academic performance and learning style. It concludes that learning style is related to academic achievement among college students.

The paper begins by building a theoretical framework for this hypothesized relationship based on national reports and study panels which seek to establish national performance standards for education. Unfortunately, the national standards efforts are aimed primarily at K-12 education, while this study focuses on college-level study in agriculture. The authors cite Beyer (1984) to suggest that standardized tests are inadequate to assess students' critical thinking skills but then they suggest that student learning styles can be adequately assessed by the Group Embedded Figures Test (GEFT).

The procedures for the study are clearly described. The primary instruments are the GEFT and student data from college records. The reader is assured that the GEFT is a valid and reliable instrument. While the GEFT was developed for a less specific population than the one under study, no reliability estimates are provided for either the original population or the specific population in the study.

The data were analyzed using Pearson product-moment correlations. The reader is left to wonder why the subjects were divided into a dichotomous grouping (field dependent and field independent) if the analyses were conducted using a statistic designed for interval or ratio data. In fact, one wonders if a GEFT score is anything higher than ordinal data, or the nominal data constituted by the dichotomous grouping.

The paper (as reviewed by this discussant) would have benefitted from a final proof reading as numerous grammatical and typographical errors are present in the text. For example, the first sentence in the Conclusions section stated that the learning style of freshmen, "...tended to be leaning towards field-independent, but not in any practical terms." What does this mean?

Based on the voluminous research on learning styles in agricultural education, which seeks little more than detailed description of each and every possible sub-group of clients, isn't it time to move beyond descriptive studies to developing and testing practices to improve education?

Concurrent Session J

Theme:
Extension
Education

Chairperson:
Brenda Seevers
New Mexico State University

Discussant:
Julia A. Gamon
Iowa State University

Facilitator:
Earl Russell
University of Nebraska

Extending Education to Society: A University of Idaho Faculty Survey of Attitudes Toward Education Through University Extension

Donna May Hansen, University of Idaho
Douglas A. Pals, University of Idaho
John E. Carlson, University of Idaho

Kenya Women in Small-Scale Rural Enterprises: The Role of the National Extension Service

Humphrey G. Tirima, University of Idaho
Douglas A. Pals, University of Idaho

The Perceived Existing and Desired Management Systems of the Mississippi Cooperative Extension Service and Their Relationship to Employee Motivation

Hassan Sadighi, Mississippi State University
Matt R. Raven, Mississippi State University
Walter N. Taylor, Mississippi State

Extending Education To Society: A University Of Idaho Faculty Survey Of Attitudes Toward Extending Education Through University Extension

Donna May Hansen
University of Idaho

Douglas A. Pals
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Introduction

Public higher education faces multiple challenges as it approaches the Twenty-first Century. Funding cuts are forcing institutions to search for ways to operate more efficiently and effectively with reduced appropriations. Social and technological changes, and increasingly diverse and complex publics requesting services are placing expectations and demands of unheralded proportions on educational resources (Wagner, 1993). As demographics, public needs, and the face of agriculture change, Land Grant Universities are reexamining their purpose, mission, who they serve and how they serve.

The College Land Grant Act of 1862, which established Land Grant Universities, provided education the freedom to respond to an ever-changing society. This legislation was influenced and shaped by a concept of democracy that allowed people to learn by doing (Eddy, 1957, Nevins, 1962). How the original intent of the Act of 1862 is interpreted in light of today's society becomes a challenge facing today's administrators and faculty.

Theoretical Framework and Historical Foundation

The epoch legislation establishing Land Grant Universities was spurred by two major movements in the early 1800s. One movement was to establish colleges of agriculture and industrial arts; the other, born of a broader concept, was to reform education by establishing "people's colleges".

As the concept of democracy and the desire for opportunity grew, a useful and practical education was seen as remedy to class and economic disparity. With the passage of the College Land Grant bill of 1862, a broad segment of the population had available a practical education that had direct relevance to their daily lives.

As science came into an era of respectability, and colleges accommodated society's emphasis on "usefulness" by shaping their curricula to address these growing needs (Eddy, 1957), colleges became centers of learning in all areas of life. How to approach learning in all areas of life was a new question for educational institutions. The traditional approach to learning had involved books, memory, and recitation. Now students would learn by doing—observing, comparing, analyzing, and synthesizing. This would require a shift from deductive to inductive reasoning. In one arena, direct applications of science to the problems of agriculture by extending knowledge from the research laboratory to the practitioner would become an approach to learning that would have far-reaching effects.

Inherent in the philosophy underlying the College Land Grant movement is the idea that public education has a responsibility to provide direct, practical application of knowledge to the lives and interests of people (Eddy, 1957). This concept gives rise to the function of taking knowledge beyond the campus to the homes, farms, businesses and communities of the people themselves—extension.

The concept and practice of extension had its genesis in English universities as lectures for mechanics and artisans' libraries (Shannon & Schoenfield, 1965). This form of education, born from non-university interests, was mirrored in American society. The American Lycea, Farmers' Institutes, and Chautauqua Institutions were vehicles for self-education through lectures on farming, culture and entertainment, and programs of home-study and reading (Eddy, 1957, Shannon & Schoenfield, 1965). These organizations laid the groundwork for extending education beyond the resident college campus into the community.

Smith-Lever legislation in 1914 funded a partnership between the United States Department of Agriculture (USDA) and the agricultural and educational expertise of the Land Grant University into a public service program known as the Cooperative Extension Service [now System]. This legislation propelled the concept of extension into the most successful informal education and public service program in the history of American education.

Shannon & Schoenfield (1965) point out, however, that "this instrument [Cooperative Extension] represents only a small segment of the university and reaches only a small segment of society" (p. 64). They continue, "The time is seemingly at hand for agricultural extension to lend its considerable skills and resources to the fashioning of a truly university-wide, community-wide outreach enterprise" (p. 64).

Purpose and Research Questions

The over-all purpose of this study was to determine how University of Idaho faculty feel toward extending university education in service to society—the extension component of the tripartite mission of Land Grant Universities.

As Land Grant Universities rethink their position within the community of citizens they serve, it is important to consider the community of scholars who will effect and be affected by redirection, redefinition, and restructuring of university knowledge delivery systems. Administrative leaders have been surveyed regarding their views toward extending education (Meyer, 1992, 1995). How teaching faculty feel about this function is less known. The interest and commitment faculty have toward their university is the force driving teaching and public service roles, and involvement with internal governance (Harshbarger, 1989). Knowing the attitudes of faculty toward extending education becomes central to efforts to elevate the extension mission to inclusive and vital levels.

This study addressed questions regarding the topic of extending education through general or university extension as an approach to fulfilling the public service mission of the Land Grant University. In general, what are the attitudes of University of Idaho faculty toward extending education through general or university extension?

Specific research questions included:
1. How do faculty view the University's responsibility to the community of citizens from which it derives support?
2. How do faculty view extension as a mission of the entire University?
3. How do faculty view institutionalizing the lines of communication for extension?

Related questions included:
1. Which faculty are currently involved, or interested, in teaching adult or continuing education?
2. What is the faculty's level of understanding of the history of Land Grant Universities and extension?
3. What are faculty perceptions about the involvement of the College of Agriculture in present-day society?

In addition to determining attitudes, interest, knowledge, and perceptions of faculty, an objective of this study was to examine the relative influences of selected background characteristics on issues related to these areas of consideration.

Methodology

Research design. This was a descriptive one shot case study using a survey data collection procedure (Babbie, 1995). The Total Design Method (Dillman, 1978) guided the survey development and data collection. Multiple classification analysis (MCA) (Andrews, Morgan, Sonquist & Klem, 1973) was used to examine the strength of interrelationships between independent and dependent variables.

Data collection instrument. The questionnaire contained Likert-type close-ended questions and one open-ended question. The close-ended questions became the dependent variables to be correlated with demographic characteristics (independent variables) of the respondents.

Approval to survey University of Idaho faculty was obtained from the Office of Human Assurances. The Social Survey Research Unit of the College of Agriculture obtained a list of full-time faculty from Management Information Services. The list was accurate to fall semester 1995. A systematic random sample was generated via computer by selecting every other name on the list. From the non-sample list, 13 faculty names were selected for pre-testing the survey. Effort was made to obtain representations from several disciplines. The 12 pre-test surveys returned formed the basis for revisions; and the survey instrument was reviewed by people familiar with the Extension system. The Social Survey Research Unit (SSRU) printed and mailed the instruments. Questionnaires were coded prior to mailing for identification and to protect confidentiality.

Data collection procedures. The initial mailing of questionnaires was followed with reminder postcards, and a second mailing of instruments. SSRU staff entered the responses from the questionnaires into the computer as they were returned.

The response rates for the survey were:

On-Campus Faculty (220/307):	72%
Off-Campus Faculty (80/86):	93%
Total Faculty (300/393):	76%

This provided an accuracy of ±5% at the 95 percent confidence level.

Data analysis procedure. Data were analyzed with the Statistical Package for the Social Sciences (SPSS^{X}). Rankings of the Likert-type scales were converted to numerical classes (1 to 4). Example: 1 = Strongly Disagree/Not Important/No Interest. Missing data or "Don't Know" responses were coded as 9 = Missing.

Frequencies, percentages, and means were run on the attitude, interest, knowledge, and perception questions, and on selected background characteristics of the respondents.

Factor analysis was used to reduce the large number of variables into fewer groups with underlying dimensions or threads of commonality (Kim & Mueller, 1978). Factor analysis was used to group the attitude questions into three scales and each was assigned an acronym:
(1) SOCIALRESP: responsibility of the University to society,
(2) UNIVEXTN: extension as a university mission,
(3) LINKAGES: lines of communication for extension.

Items which had a factor loading of .30 or higher were included in the scale (Bennet & Bowers, 1976).

Similar treatments were given scales:
(4) INTERESTTEACH: interest in teaching adult education,
(5) INTERESTUEXTN: interest in university-wide extension,
(6) KNOWLHIST: knowledge of the history of Land Grant Universities and extension,
(7) PERCEPTCOA: perceptions of College of Agriculture activities.

Cronbach's alpha test for reliability estimated how well items in the new scales were internally consistent (Babbie, 1995). Cronbach's alpha test also revealed no significant difference between early and late respondents (Goldhor, 1972). Analysis of variance (ANOVA) provided the levels of significance for the scales and variables (Babbie, 1995). A .05 level of significance was selected to interpret the strength of the predictors on the dependent variables.

Multiple classification analysis (MCA) was used to examine the relative strength of the interrelationships between predictor variables and the dependent interval variables (Andrews, et al., 1973). Beta coefficients approximated the relative ability of each independent variable to predict the dependent variable while assuming that all other predictors are distributed as they would be in a large population (Andrews, et al., 1973). Multiple R squared indicated the proportion of variance in the dependent variable explained by all the independent variables acting together (Andrews, et al., 1973).

Findings

Sample Background Characteristics

Of the 300 faculty who responded to the survey, 24 percent were female, and 76 percent were male. Of the 293 respondents who revealed their ages, 39 percent were in the 45 to 54 year old range, and 30 percent in the 35 to 44 year old range. Of the 289 respondents who indicated their length of employment, 52 percent have been at the University of Idaho for 1 to 10 years, and 22 percent for 21 to 35 years.

College affiliations of respondents were derived from the mailing list furnished by Management Information Services. Respondents were categorized into four groups: (1) Natural Resources, (2) Professional Fields, (3) Social Sciences & Humanities, and (4) Cooperative Extension Districts. These categories became independent variables for determining associations between college affiliations and the dependent variables. The colleges represented in each of the categories were:

College Affiliation:		College Affiliation:	
NATURAL RESOURCES (n=74)		PROFESSIONAL FIELDS (n=65)	
Agriculture	14%	Art & Architecture	2%
Forestry/Wildlife/Range Sciences	8%	Business & Economics	3%
Mines/Earth Sciences	3%	Engineering	9%
		Law	2%
SOCIAL SCI & HUMANITIES (n=80)		Graduate Studies /Related Units	5%
Letters & Sciences	22%		
Education	5%		
COOP EXTENSION (n=80)			
Extension Districts	27%	TOTAL	100%

Faculty Attitudes Toward Extending Education Through University Extension

Through factor analysis, the 29 attitude questions were grouped into 3 sets of conceptual scales, each with an underlying dimension or thread of commonality. In order to maintain reliability of the scales, respondents answered a minimum of two-thirds of the questions within the scale to be included. (See Table 1.)

Table 1
Multiple Classification Analysis: Variance in Interval Scales SOCIALRESP, UNIVEXTN, and LINKAGES

	SOCIALRESP	UNIVEXTN	LINKAGES
Background Characteristics	n = 274	n = 267	n =215
	M = 3.349	M = 2.940	M = 2.816
	Beta =	Beta =	Beta =
Sex	.18**	.26***	.16*
Age	.17	.16	.18
Terms of Employment	.16	.15	.19
Highest Degree	.02	.08	.05
Years Employed by U of Idaho	.03	.11	.13
College Affiliation Category	.18	.27**	.13
Teaching Appointment	.20	.20	.09
Research Appointment	.03	.10	.01
Administrative Appointment	.01	.06	.02
Extension Appointment	.03	.04	.04
R^2 =	.116	.200	.158
Cronbach's Alpha =	.7779	.8271	.7795

The mean for each scale is the average score for all the items in the scale.
*** $p < .001$, ** $p < .01$, * $p < .05$

1. Social responsibility theme: In this study, gender was statistically significant with female faculty more likely than male faculty to see the University as having major responsibilities to the larger society. Although age and college affiliation were not statistically significant, faculty 45 and older indicated stronger attitudes regarding the social responsibilities of the University, and faculty in Cooperative Extension and Natural Resources were more likely than faculty in Social Sciences & Humanities, to view the University as having responsibilities to society at large. (See Table 1.)

2. University extension theme: Gender and college affiliation were statistically significant with female faculty more likely than male faculty, and Cooperative Extension faculty more likely than other faculty, to view extension as a mission of the entire University. Although not significant, faculty 55 and older, and faculty with 51 percent or more teaching appointments, showed stronger attitudes in favor of extension as a University mission. (See Table 1.)

3. Linking lines of communications theme: Gender was statistically significant with female faculty more likely than male faculty to favor institutionalizing lines of communication within the university structure. Although not significant, faculty in Professional Fields, Natural Resources, and Cooperative Extension were more likely than faculty in Social Sciences & Humanities, to favor institutionalizing communication links to improve connections with the community at large. (See Table 1.)

Mean scores. Comparing the patterning of mean score responses for the scales allows interpretation of the influences of the independent variables. The following figures illustrate the influences of collegial affiliation on attitudes (Figure 1), interest (Figure 2), and knowledge and perceptions (Figure 3).

Faculty Interest and Current Involvement in Extending Education as Adult or Continuing Education

4. Interest in teaching theme: In this study, college affiliation was statistically significant as an explanatory variable for interest in teaching adult education type courses. Faculty in Cooperative Extension and in Natural Resources were more likely than faculty in Professional Fields or Social Sciences & Humanities, to be interested in teaching adult or continuing education. (See Figure 2.)

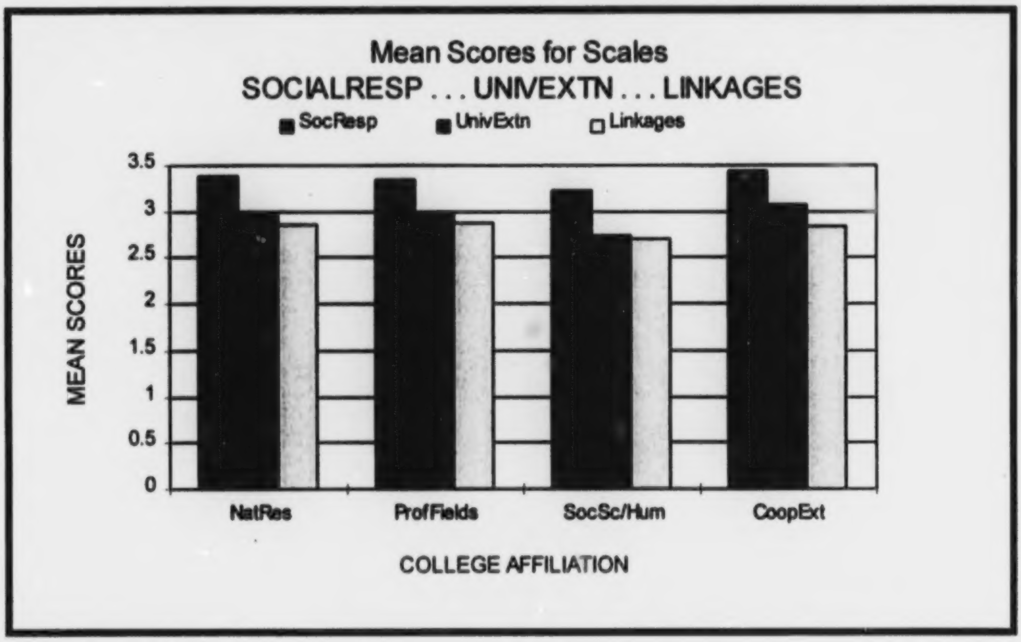

Figure 1

5. Interest in university extension theme: Although not statistically significant, female faculty indicated more interest than male faculty in a university-wide extension organization. Similarly, faculty in Natural Resources were more likely than faculty in the Social Sciences & Humanities to indicate interest in an extension organization that involved all academic disciplines. (See Figure 2.)

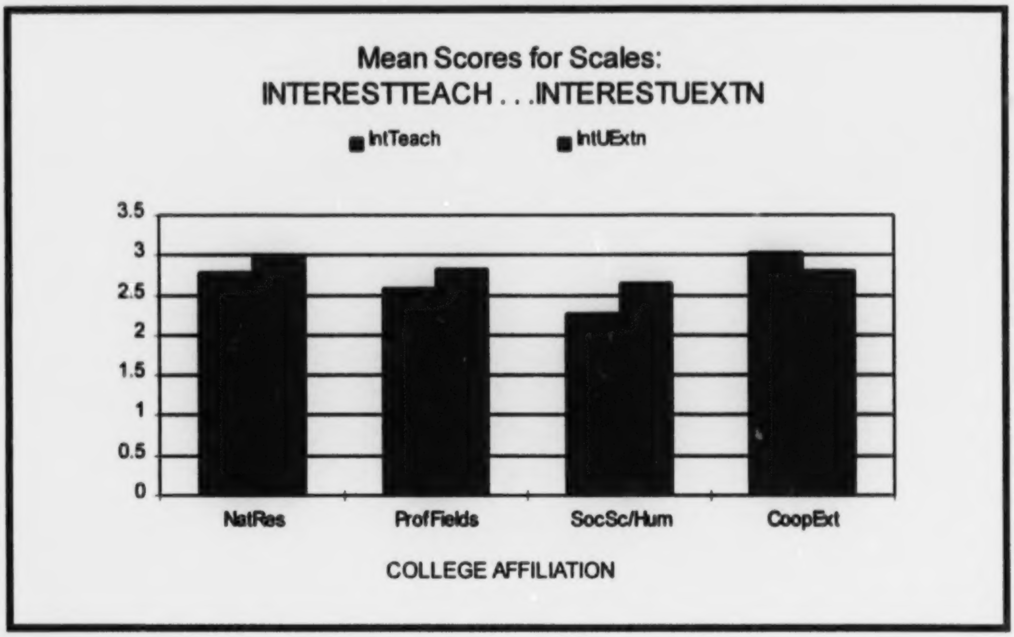

Figure 2

Faculty Knowledge of the History of Land Grant Universities and Extension

6. Knowledge of history theme: College affiliation was statistically significant with faculty in Natural Resources displaying the most knowledge, followed by faculty in Cooperative Extension, of the history of Land Grant Universities and extension. (See Figure 3.) Although not significant, male faculty, and faculty 45 and older, were more likely to be familiar with the origins and development of these topics.

Faculty Perceptions of Which Areas the College of Agriculture Serves in Present-Day Society

7. Perceptions of College of Agriculture theme: Gender was statistically significant with female faculty demonstrating greater awareness of College of Agriculture activities. Also significant was college affiliation, with faculty in Natural Resources showing the greatest awareness, followed by faculty in Cooperative Extension. Faculty in Professional Fields and Social Sciences & Humanities were less likely to know what the College of Agriculture does. (See Figure 3.)

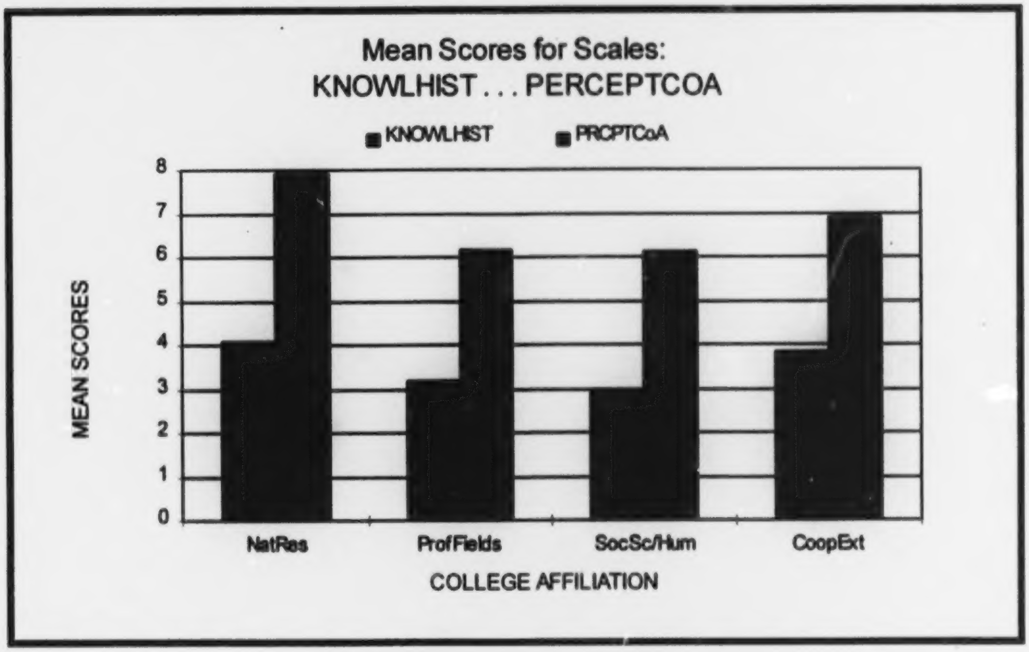

Figure 3

Conclusions, Recommendations, and Implications

This study reveals attitudes of University of Idaho faculty toward extending education through general or university extension by addressing questions related to this topic. Analyses of data from 300 returned survey instruments detect trends in attitudes.

Analyses of data show inclinations by women faculty to favor an institutional organization which supports the extension function in all academic fields, and a teamwork approach to serving society.

Age, as an influence, does not provide consistent trends regarding attitudes, although older faculty seem to be somewhat more favorable in their outlook toward the over-all concept of university extension.

Gender and age appear to influence levels of understanding. Male faculty are more likely than female faculty to know the history of Land Grant Universities and extension, whereas female faculty are more likely than male faculty to be aware of which areas the College of Agriculture serves in present-day society. Faculty 45 and older are more likely than faculty 44 and younger to know the history; and faculty 55 or older are more likely than faculty 54 or younger to know which areas the College of Agriculture serves.

College affiliation appears to influence certain trends. Faculty in Cooperative Extension and Natural Resources are more likely than faculty in the Social Sciences & Humanities, to see the University as having responsibilities to the community of citizens from which it derives support. Faculty in Cooperative Extension are the most likely to view extension as a university mission. Faculty in the Professional Fields, Natural Resources, and Cooperative Extension are more likely than faculty in the Social Sciences & Humanities, to favor institutionalizing communication links to improve connections with the community at large.

In addition, faculty in Cooperative Extension and in Natural Resources indicate more interest than faculty in Professional Fields or Social Sciences & Humanities, in teaching adult or continuing education. Faculty in Natural Resources are more likely than faculty in the Social Sciences & Humanities, to be interested in an institutionalized extension organization. Of the 131 respondents who report that their departments already extend instruction as adult or continuing education, 44 percent are from Cooperative Extension Districts, 30 percent are from Natural Resources, and 13 percent each are from Professional Fields and Social Sciences & Humanities.

Faculty in Natural Resources display the most knowledge about the history of Land Grant institutions and extension, followed by faculty in Cooperative Extension. Faculty in Natural Resources appear to be the most likely to know which areas the College of Agriculture serves, followed by faculty in Cooperative Extension.

The data suggest that faculty in Social Sciences & Humanities have limited views of the roles they play in the Land Grant University system. The literature alludes to the difficulty of bringing the social sciences and humanities into the mainstream of applied research (Allen, 1963; Friedman & Friedman, 1976). The results of this study suggest that while some progress has been made, more can be done. Consistently below-the-mean scores for collegial affiliation with Social Sciences & Humanities point to how slowly attitudes change.

Historically, neither the public nor academe has regarded social science research as "real" science (Friedman & Friedman, 1976). A lack of public confidence in the ability of social scientists to provide solutions to social problems is compounded by the academy perpetuating an insular attitude within the field by recognizing individual achievement rather than teamwork (Friedman & Friedman, 1976). In addition, social and behavioral science is fraught with problems of measurement. Human thinking and acting are influenced by a multitude of variables, conscious and unconscious. Human unpredictability and contrariness preclude precise measurement of attitudes and behaviors. Instead, these variables are measured in terms of patterns or trends.

As society becomes more complex, the knowledge base of many disciplines is needed. The economist, political scientist, historian, anthropologist, linguist, artist, musician, sociologist, business administrator, and public administrator need to sit at the same table with the scientist and engineer.

As demographics, economics, and social changes occur, so do knowledge needs. Complex societal problems preclude viewing the world with monocular vision. Knowledge from many perspectives must be included in the equations for solving the problems of society.

The purpose of education is to make intelligent, thoughtful judgments. It is instructive to remember that the call to extend education originally came from the citizens who wanted and needed knowledge that had direct application to their lives. It was the need for useful, practical knowledge that drove research; it was the knowledge needs of the practitioner that energized the movement to establish public institutions so labeled "democracy's colleges".

It was the public need for knowledge that drove the movement to establish Land Grant institutions and Cooperative Extension. The Land Grant University responded then—it must again. The institution must provide the environment where interdisciplinary research and application is encouraged and rewarded.

By institutionalizing university extension, the University provides a vehicle for communication between the researcher, extension faculty, and the public. Linking these constituents is vital if the Land Grant University is to fulfill its social contract with the citizens it serves.

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Extending Education to Society: a University of Idaho Faculty Survey of Attitudes Toward Extending Education Through University Extension

A Critique

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The tripartite mission of the land-grant university-- teaching, research, and outreach-- and faculty attitudes toward the latter, is the focus of this study. Land-grant universities were begun to reach out toward an unserved portion of the population, children of the working people, and have continued their practical approach. The question is how do faculty feel about the extension mission of the university? And faculty in this study included the whole community of scholars, not just those who have traditionally been involved with Cooperative Extension. This question is pertinent today as the concept of university extension gains momentum and as universities revisit their mission in light of changing " demographics, public needs and the face of agriculture."

I commend the researchers for the accurate and concise history of the land-grant movement and Cooperative Extension. They have captured the essence of the historical background in a few tightly-written paragraphs. The rest of the introduction is not as clear. A person unfamiliar with the concept of university extension might have difficulty seeing the relationship of the title and introductory paragraphs to the purpose of the study. The study missed an opportunity to enlarge the body of knowledge on the topic of extending the university out in the state; previous research (Meyer, 1992, 1995) had asked administrators about their views of extension, but no comparisons were made with those studies.

The rationale for the use of Multiple Classification Analysis rather than regression analysis in the methodology was to handle independent variables that are nominal or ordinal in nature. What is the reference for a plus or minus 5% at the 95% confidence level? What is the reliability of the instrument? A Likert-type scale is usually a 5 point scale; what was the rationale for a 4 point scale? Why was such a low factor loading (.30) used?

The questions posed in the objectives are clearly addressed in the findings. The background characteristics are in more detail than needed for percentages in each discipline. It would be helpful to cite the percentages in each college. For example, Natural Resources has 74, which is 25% of the 299 responses.

It is incorrect to state that there are differences in responses unless the differences are significant; otherwise, differences may be due to chance. An expansion of the university's outreach mission is an appropriate recommendation for this study, but the editorial comments are overdone.

The paper could use some editing for comma usage, capitalization errors, and grammatical mistakes. The questions in the objectives are numbered differently than the ones in the findings. The numerical findings should be rounded up to two decimal places rather than four. The figures in the colleges add up to 299, not 300 responses.

Kenya Women In Small-Scale Rural Enterprises: The Role Of The National Extension Service

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University of Idaho

Douglas A. Pals
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Introduction

Kenya is a country of political and economic importance, located in Eastern part of Africa. About two-fifths of the total area of 582,646 Km^2 is arable while the rest is arid or semiarid. As a result, about 35% of Kenya's total population of about twenty-eight million people, and most economic activities are concentrated in the arable two-fifths of the country (Todaro, 1994).

The economic mainstay of Kenya is agriculture, which accounts for more than one-third of GDP and about 70% of all export earnings. Kenya faces a multitude of problems in the 1990s, namely, stagnating economy, growing political strife, a substantial budget deficit, high unemployment, and a substantial balance of payments problems. However, an increasing population growth rate is the principal problem of Kenya. In recent past, Kenya had one of the highest (about 3.9% - 1980 to 1990 estimates) population growth rates in the world (Todaro, 1994). The United Nations Development Program (UNDP) estimates for 1995 indicate that population growth in Kenya has dropped to about 3.6% and fertility rates among women have decreased by 22%. Even with the lower fertility rates, population growth rate is bound to remain high due to demographic momentum, which is propelled by the large proportion (about 50% of the total population) of children and adolescents in the nation.

Theoretical/Literature Base

With an unemployment rate of more than 30% and its growing population, Kenya faces a critical task of creating employment (Ghazanfar & Bailey, 1991). Although agriculture is the chief sector in Kenya's economy, the uneconomic subdivision of land due to high population density, has resulted in decreased acreage per person (Todaro, 1994). Consequently, farms are becoming a less significant source of employment (Todaro, 1994; UNDP 1995; Herz, 1989). There has to be other sources of employment. Ghazanfar and Bailey (1991) suggested that small enterprises would be a significant source of employment in Kenya in the near future.

Studies indicate that despite their devotion to domestic chores and resource-based activities, many women in Kenya and in other third world countries are playing a key role in the emerging informal sector (Grigsby & Ghazanfar, 1992; Herz, 1989; Gitobu & Gritzmacher, 1989). In Kenya, the role of women in development of small enterprises is becoming more recognized and apparent. For instance, the basket weaving industry, which has turned into a large export venture, is primarily owned and run by women. Most third world women employed in small scale enterprises make important contributions to households, especially among low-income families and their entrepreneurship, typically, is a self-directed poverty reduction strategy, particularly when agriculture and formal employers cannot provide work (Rhyne and

Holt, 1994). There is evidence that women spend their incomes in meeting family needs, with likely benefits for child welfare, nutrition, education and health. In addition, when some women's businesses grow, they offer employment for others (Rhyne and Holt, 1994). Further evidence suggests that women who are involved in non-resource-based activities tend to have low fertility rates as their demand for children as a source of social security or other forms of psychological satisfaction is decreased (Todaro, 1994). Thus, the encouragement and support of women in small scale enterprises will contribute to alleviating the problems of high population growth rates and poverty in Kenya.

In the limited research that has been published on the role of women in small scale rural enterprises in Kenya and Sub-Saharan Africa, some of the following observations have been made (Rhyne and Holt, 1994; Herz, 1989, Gitobu & Gritzmacher 1989; World bank, 1989; Ng'ethe & Wahome, 1987):

1. Women's businesses tend to start smaller and stay smaller.

2. Women's businesses concentrate in commerce, services and light manufacturing industries (particularly sub-sectors using traditional technologies).

3. Most women owned businesses employ family members rather than hired labor.

4. Women's businesses are often based away from busy markets (in their homes).

5. Many women entrepreneurs experience constraints such as, time consuming domestic responsibilities, restricted access to productive resources such as, financial services, asset ownership, and a lack of business skills.

A survey of the informal sector conducted in Kenya revealed that many people, especially in rural areas, had very little access to government agencies and other non-governmental organizations that provided training in business skills (Ng'ethe & Wahome, 1987). However, the majority of people in rural Kenya have access to the National Extension System (NES), which mainly offers training in agricultural production and home economics (World bank, 1989). There is some evidence that the NES plays a role in educating entrepreneurs, although that role could be expanded (World Bank, 1989).

Purpose and Objectives

The purpose of this study was to explore the status of women entrepreneurs in Meru District, Kenya. The specific objectives of this study were to:

1. Explore the status and limitations of women entrepreneurs in Meru District.

2. Explore the role of the National Extension System in Rural Women Entrepreneurship.

Methods and Procedures

The data for this study were collected from an exploratory (Babbie, 1995) survey conducted in Ntima and Nyaki locations of Meru District. A systematic random sample of 41 women entrepreneurs was selected from a list of 156 women entrepreneurs available at the district headquarters. Every fourth person on this list was selected for an interview and if a person was not available for an interview, the next person on the list was selected.

A questionnaire was developed based on previous studies done in Kenya and other sub-Saharan Africa countries (McCaslin and Mwangi 1992; Mead, 1991; Gitobu and Gritzmacher, 1989; Ng'ethe and Wahome, 1987) and the Washington State University's Small Business Research Unit staff. The questionnaire included three sections. Section 1 was designed to collect demographic data. Section 2 collected data on business characteristics, which included types of enterprises, legal structure of businesses, years of business operation, reasons for entry, business and other responsibilities of women in the study, annual personal income, sources of finances for businesses and skills of respondents.

The role of the National Extension System (NES) was explored in the third section. The respondents were asked if they had participated in training organized by the NES and if they had any experience with the Agriculture Society of Kenya. The sources of information for the women entrepreneurs were also explored in this section.

Four (4) Likert-type closed ended questions were designed to explore the opinions of women entrepreneurs toward the role of the NES in women entrepreneurship and development in general. The scale values were, 1=Strongly agree, 2=Agree, 3=Disagree, 4=Strongly Disagree, 5=No Opinion. Factor analysis was run on the responses to these questions. The resultant factors did not yield acceptable alpha values. The probable explanation for the low alpha values is that the four questions did not explore a continuous set of attitudes. Rather different aspects of the National Extension System were explored. Therefore, each of the Likert-type questions was treated as a dependent variable and assigned an acronym, namely, National Extension System should play a bigger role in educating entrepreneurs (NESBREE); there should be more women involved with the National Extension System (MOWONES); the National Extension System should not only be involved in agricultural development (NESAGDEV), and the National Extension System only concentrates on male clientele (NESCOMA). Each of these variables was used as a dependent variable with selected background and business characteristics as independent variables in a Multiple Classification Analysis (MCA). The relative strength of the interrelationships between predictor and the dependent variables was examined using MCA (Andrews, et al., 1973). MCA is a multivariate statistical procedure similar to multiple regression. However, it is able to handle independent variables that are nominal or ordinal in nature (Nie, et al., 1975; Andrews, et al., 1973).

Appropriate data for a Multiple Classification analysis (MCA) usually consists of one dependent variable that is measured on an interval scale or dichotomy and it should not be badly skewed (Andrews, et al., 1973). The frequencies of the responses to these questions were badly skewed (Table 1); therefore, the scale values were combined to reduce the skewness. NESBREE was reduced to two scale values, 1 = Strongly Agree and 2 = Not Strongly Agree, with No Opinion responses being left out. MOWONES was given the same treatment as NESBREE. With NESAGDEV, No Opinions were left out and the question was reduced to two scale values, 1= Agree and 2 = Disagree. NESCOMA was given the same treatment as question NESAGDEV.

Section 4 was designed to explore the limitations or constraints the respondents experienced in running their businesses.

Results and Discussion

More than half (58.6%) of the women interviewed were 39 years or younger, with the mean age being 38.5. Majority of respondents (82.9%) were married and had children, the mean number of children per woman being three (3). This figure is low compared to the national average children per woman in Kenya, which is about seven (7) (United Nations Development Program, 1995). Of the 82.9% women in the study who completed secondary education less than three fourths (71%) had acquired some post high school education or training, which was either a certificate course in their field of business operation or a diploma course. Only three (7.3%) of the women in this study had completed a degree program.

The Status and Limitations or Constraints of Women in Business

Status of Women Entrepreneurs - The study respondents were involved in a variety of business activities, of which almost three fourths (72.7%) were retail in nature. Clothing and hair salons seemed to be more common (39.1%) type of business than the rest. Mixed groceries were also commonly sold (14.6%) as many individuals and families in the rural areas tend to spend a major portion of their income on necessities. Only 7.3% of the respondents operated restaurants.

Slightly more than half (53.7%) of the businesses were partnerships while the rest (46.3%) were forms of partnership. Many women in the study (42.5%) had their businesses registered under their names. Almost one-third (30%) of the businesses were registered under both the husband and the respondent. Few enterprises (12.5%) were registered under the husbands' names, while the rest were registered under another relative's name (10%) and as limited company (5%).

The modal reason for entry into business was that of economic independence and 43% of the respondents checked this response. Nearly one-fourth (24.4%) of the respondents went into business to supplement their income and another 24.4% wanted to be their own bosses. Few women entered into business because they were unsatisfied with previous jobs they held (7%) or because they could not find another job (7%).

More than half (58.5%) of the women in the study had been in business for five or fewer years, 19.5% had been in business for six to ten years and 22% had been in business for more than ten years. Thus, most of the women interviewed had relatively little experience in business.

Among the women entrepreneurs interviewed, 65% responded that they had some formal training for the position they held in their businesses, while 35% said that they had no training. Most of them had trained in fields that directly involved the types of businesses they run. For example, those who had medical clinics or human specimen laboratories had some training in either nursing, clinical medicine or laboratory technician training. Those who had hair salons had some training in hair dressing. Only 22% of the total number of the women interviewed indicated they had some business management training. Forty-two percent (42%) of the women interviewed indicated that they desired some training in business management, while another 42% indicated that they would like training in their fields of operation. This might be an indication of the need for training among rural women entrepreneurs.

A majority of the women interviewed performed most of the day-to-day business tasks, such as purchasing and selling of goods or services (65%), determining times to open and close their businesses (89.2%), hiring and firing employees (88.9%), and giving credit to customers (91.2%). Slightly more than half of the respondents (57.5%) kept business records and did some banking. Some of the banking and record keeping were done by their husband, children or hired help. Less than half the women borrowed money for business. Some of the borrowing was done either by the husband or by both the husband and wife.

The respondent's were asked if they had ever borrowed from a lending institution, such as a bank. If they had not borrowed, they were asked to give reasons. Half (50%) of the women entrepreneurs in the study indicated that they borrowed money from a lending institution while the other half indicated they had not due to various reasons.

The major reasons cited by the respondents for not borrowing were, their husband was doing it (33.3%) and others felt they did not have adequate collateral (30.3%). Twenty percent (20%) of the women in the study indicated that they did not borrow because they lacked the skills. Some thought they had adequate finances (10%), and one respondent indicated that she was not aware of the possibilities of acquiring loans.

Apart from running their businesses, many women were involved in other activities. The majority of women interviewed (87.5%) were involved in managing their home. Eighty percent (80%) of the women in this study were involved in raising crops and livestock to feed their families. They sold produce only when there was surplus. Sixty percent (60%) of the women were directly involved in raising their families. Few women had other jobs (15%) and businesses (10%).

When asked what their annual personal income was, two women did not respond to this question because they felt that it was a sensitive issue and that the Income Tax Commission may gain access to any financial matter they divulged. Among those who responded to this question, 30.8% earned US$999 or less, slightly more than one-third (35.9%) earned between US$1000 and US$4999, and 15% earned between US$5000 and US$9999. Few (17.9%) women earned over U$10000. The mean of income among the respondents was US$5419.25, which is eighteen times higher than the US$300 per capita income in Kenya (UNDP, 1992).

Almost three-fourths of the women interviewed indicated that they financed their businesses from family or personal savings. More than half the respondents (55%) checked that they financed their businesses with loans or bank overdrafts. Nearly three-fourths (72.5%) financed their businesses with the profits they earned and only 10% used moneys from women or support groups.

About one-fifth (23%) of the respondents used most of their income in their businesses, while (66.7%) used most of their income for school fees or household needs. Approximately ten percent (10.3%) of the women used most of their income in developing other businesses. Clearly, a large proportion of income earned by the respondent was used for domestic purposes, namely, household needs and school fees.

Limitations and Constraints of Women Entrepreneurs - Almost one-third (34.2%) of the women interviewed cited competition as a major problem they experienced. These respondents felt that competition, especially from bigger businesses, was unfair. The other operations problem that seemed to stand out was that of seasonal demand of merchandise. This, as 22% respondents indicated, caused cash flow problems. Active demand for goods and services in rural Kenya is high during the period immediately following harvest as many rural dwellers depend on cash crops as a major source of income.

In marketing, the major problem cited by many entrepreneurs was that of competition from similar enterprises. Approximately two-thirds (66.7%) of the women respondents indicated that they experienced stiff competition from similar (similar in terms of size and merchandise sold) enterprises. Approximately fifteen percent (15.4%) of the women in this study indicated that location was a problem to them. More than one-fourth (28.2%) of the respondents had a problem of holding stock for too long. Approximately eighteen percent (17.9%) of the entrepreneurs indicated that they lacked adequate business facilities.

Access to capital for many women was a problem. Over two-thirds (68.3%) of all the women interviewed indicated that it was difficult for them to acquire capital.

The reasons given as to why capital availability was a problem were, inadequate collateral to acquire loans, unwillingness to risk the limited acreage of land available to acquire loans, a lack of skills to carry out this task, and high interests rates charged by banks and other lending institutions. Nearly three-fourths (74.1%) of the twenty-eight women in this study who admitted to experiencing problems with capital availability, indicated that the major reason for lacking capital is inadequate collateral. Most banks and other lending institutions require land as the major security to give loans. The Meru traditions did not allow women to inherit or own land, until recently. As a result many women do not possess land. Most land title deeds are owned and kept by men. Thus, a woman has severe limitations when it comes to borrowing money.

The Role of the National Extension System in Entrepreneurship

When asked if they had ever participated in any form of training organized by the National Extension System, more than 80% of the women responded that they had not. Only seven women indicated that they had participated.

Clearly, the National Extension Publications were not a significant source of information among the women interviewed. Only two respondents indicated that they used the National Agricultural Service publication as a source of information for their business. About 44% of the respondents, indicated that newspapers and magazines were important sources of information for their businesses. Less than 15% of the women interviewed indicated that they used television, radio, other government publications and other business publications as sources of information for their businesses. Many women, however, responded that customers, colleagues and suppliers were an important source of information for their enterprises.

As revealed in Table 1, all respondents but one either strongly agreed or agreed that the NES should play a bigger role in educating; approximately 93% strongly agreed or agreed that their should be more women involved with the NES; about 66% disagreed or strongly disagreed that the NES should only be involved with agricultural development; and 70% disagreed or strongly disagreed that the extension service only concentrated on male clientele. Clearly, the results were badly skewed, thus necessitating recoding so as to reduce the skewness, for the purposes of running a MCA.

During the interview process the researcher recorded that the person who checked a "no opinion" on question (a) felt that she did not have adequate knowledge of the NES to give an opinion. Five (5) people checked "no opinion" on question (d) because they felt that gender was a sensitive issue.

Table 1.
Frequencies of Respondents' Opinions on the Role of the National Extension System

	Frequencies									
Opinion Questions	SA		A		D		SD		NO	
	n	%	n	%	n	%	n	%	n	%
a) The NES should play a bigger role in educating entrepreneurs*	27	67.5	12	30.0	0	0	0	0	1	2.5
b) There should be more women involved with the NES**	25	62.5	12	30.0	0	0	0	0	2	5.5
c) The NES should only be involved with agricultural development***	7	17.5	5	12.5	8	20.0	19	46.3	1	2.5
d) The NES only concentrates on male clientele****	3	7.5	3	7.5	17	42.5	11	27.5	6	15.0

*n=40; **n=39;***n=40;****n=40

MCA for NESBREE by selected background and business characteristic (Table 2) - The most important predictor variable among all other selected background and business variables was age (beta = .65). Household size and product or service sold were second (beta=.26) and third (beta=.25), respectively, in relative importance to predict the dependent variable. R^2 indicates that 19% of the variance in the model can be explained by all the predictor variables together.

This MCA (Table 2) reveals that women that were 39 years or younger were more likely to strongly agree that the National Extension System should play a bigger role in educating entrepreneurs. Also, those who were sold groceries and ran restaurants were more likely to strongly agree that the NES should play a bigger role in educating entrepreneurs.

MCA for MOWENES by selected background and business characteristic (Table 2) - Age , in this model is the most important predictor (beta=.47). Household size is the second most important predictor in the model (beta=.39), followed by product or service sold (beta=.34). Forty-four percent (44%) of variance in this model can be explained by all the independent variables together, as revealed by the R^2.

Women who were between the age of 30 to 39 years were more likely to not strongly agree that more women should be involved with the NES. The respondents who had groceries and restaurants were more likely to not strongly agree that more women should be involved with the NES.

Table 2.
MCA: NESBREE and MOWONES by Selected Background and Business Characteristics

Background Variables	NESBREE n=39 M=1.3077	Beta	MOWONES n=37 M=1.3243	Beta
AGE		.65		.47
20 to 29	1.6035		1.4398	
30 to 39	1.4533		1.5531	
40 to 49	1.1247		.9537	
50 and above	.9442		1.2077	
MARITAL STATUS		.09		.10
Married	1.3274		1.3028	
Not married	1.2176		1.4166	
NUMBER OF CHILDREN		.14		.19
2 or less	1.2406		1.2243	
3 or more	1.3652		1.4005	
HOUSE HOLD SIZE		.26		.39
3 or less	1.4349		1.1358	
4 or more	1.1987		1.5030	
LEVEL OF EDUCATION		.11		.15
Secondary and below	1.2356		1.2126	
Post Secondary	1.3437		1.3657	
YEARS IN BUSINESS		.16		.09
5 or less	1.2785		1.2842	
6 to 10	1.4469		1.3840	
11 or more	1.2553		1.3700	
PRODUCT		.25		.34
Agro Chemicals and farm supplies	1.2023		.9851	
Clothing and Hair Salons	1.2188		1.3711	
Groceries and Restaurants	1.5220		1.5542	
Other	1.3182		1.2024	
R^2		.19		.44

MCA for NESAGDEV by selected background and business characteristic (Table 3) - A beta coefficient of .58 indicates that the number of children in this model was the strongest predictor among all the selected predictor variables. Age, with a beta coefficient of .49 is the second relative important predictor variable. Product or service sold is the third (beta=.45) in relative importance as a predictor variable, while marital status ranks fourth (beta=.40). R^2 indicated that 33% of all variance in this model could be explained by all predictor variables together.

Women between ages 40 and 49 years were more likely to agree that the NES should not only be involved with agricultural development. Respondents who were not married, also were more likely to agree with this NESAGDEV. Respondents who had been in business for 11 years or more, those who had agro chemical and farm supplies businesses, and those who had 3 or less children were likely to agree with NESAGDEV.

MCA for NESCOMA by selected background and business characteristic (Table 3) -The strongest predictor variable in relative in this model is the type of product or service sold (beta=.55). Years the respondents were in business was ranked second in the relative strength to predict the dependent variable (beta=.49) while age ranked third (beta=.29). R^2 revealed that .57% of all variance in the model can be explained by all the predictor variables combined.

- Women who had been in business for 6 to 10 years and those who sold agro chemicals and farm supplies were more likely to agree that the National Extension System only concentrates on male clientele.

Table 3.
MCA: NESAGDEV and NESCOMA by Selected Background and Business Characteristics

Background Variables	NESAGDEV n=39 M=1.6923	Beta	NESCOMA n=34 M=1.8235	Beta
AGE		.49		.29
20 to 29	1.9987		1.8801	
30 to 39	1.6515		1.8256	
40 to 49	1.3439		1.9465	
50 and above	1.8430		1.6229	
MARITAL STATUS		.40		.15
Married	1.6069		1.8524	
Not married	1.0829		1.7123	
NUMBER OF CHILDREN		.58		.18
2 or less	1.3857		1.7357	
3 or more	1.9292		1.8779	
HOUSE HOLD SIZE		.03		.06
3 or less	1.7083		1.8458	
4 or more	1.6786		1.8037	
LEVEL OF EDUCATION		.17		.17
Secondary and below	1.5775		1.9134	
Post Secondary	1.7433		1.7745	
YEARS OPERATED BUSINESS		.36		.49
5 or less	1.8364		1.8106	
6 to 10	1.5632		1.4974	
11 or more	1.4549		2.0682	
PRODUCT		.45		.55
Agro Chemicals and farm supplies	1.3724		1.4178	
Clothing and Hair Salons	1.5272		2.0284	
Groceries and Restaurants	1.9066		1.6550	
Other	1.8929		1.7897	
R^2		.33		.57

Conclusions and Recommendations

Based on the results of this study and the review of relevant literature, the following conclusions and recommendations are made:

1. A similar study should be replicated over a wider region in Kenya to determine if the same results are obtained with a larger sample.
2. With regards to attitudinal measurements, the data collection instrument and pretest procedures should be revised.
3. The National Extension System should expand its role in educating entrepreneurs, since it is an already established system, which is accessible to the majority of rural Kenya.
4. Credit should be made readily available to rural women entrepreneurs either through the government, non-governmental organizations, or the private sector. However, in availing credit the following should be considered: a) the beneficiaries should be involved in its design and management, b) the credit delivery system should be physically and culturally close to the recipients; c) collateral, credit disbursement, and reimbursement mechanisms should be flexible and adapted to the needs and the capabilities of the women entrepreneurs and; d) savings functions should be provided with credit.
5. Further research be conducted on ways to assist women entrepreneurs without causing conflict between the genders.

Implications

The task of improving the status of women entrepreneurs in Kenya will take concerted efforts, from all sectors including the government of Kenya, relevant non-governmental organizations, and leaders both at grass root and national levels. Entrepreneurship should be incorporated into the National Extension System's curriculum and presented as part of the training package to the farmers and rural dwellers.

Promoting the participation of women's groups in designing economic reforms and ensuring that those reforms go beyond macro-economic variables to include other issues that affect women in fundamental ways: such as the right to own land, is critical. Credit needs to be made available and accessible to women. In Africa, although women produce 80% of the food, they receive less than 1% of total credit to agriculture (World Bank, 1989). Micro-enterprise facilities to provide small loans to poor women entrepreneurs should be made available through both the government and the private sector.

Facilitating access to productive resources such as, land, credit, infrastructure and training for women entrepreneurs will not be a one-time event, but an institutional process, which will require constant adaptation to changing circumstances of politics, economics, and culture. Participation of women in the planning and implementation of programs will be necessary to ensure that their needs are adequately addressed and to countervail the forces of vested interests.

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Kenya Women in Small-scale Rural Enterprises: the Role of the National Extension Service

A Critique

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The topic relates directly to high population growth rates and poverty in Kenya, and the introduction cites relevant literature and provides an rationale for the importance of the study. The study's purpose was to describe women entrepreneurs and explore how Extension might play a role in their education.

The second objective could be more specific than "exploring" because the researchers studied relationships with the use of Multiple Classification Analysis and made predictions based on the findings. The paper did not mention validity and reliability of the instruments. How were these determined?

Percentages should be rounded to whole numbers, and means should be rounded to two decimal places. The tables need to have the scales printed at the bottom of each table. If the scales have responses of 1 or 2, how can the means be less than 1 (.94 and .95 in Table 2) or more than 2 (2.02 and 2.06 in Table 3)?

The researchers state in several findings that women of a certain age were more likely to agree or not agree. However, it is incorrect to state that there are differences in responses unless the differences are significant; otherwise, differences may be due to chance. There was no indication that any t-tests or analyses of variance were done to test for significant differences in age or other background and business characteristics.

This group of women entrepreneurs was unique in that they had fewer children (three compared to an average of seven) and an income 18 times higher than the average income per capita. A question is, which came first, fewer children or the job? did women with fewer children have time to have a job or did having a job mean that women were likely to have fewer children? Some comparisons of these findings with findings from other studies would be helpful. The paper does not compare the level of education (83% completing secondary school) with the national average. Are these women more educated than the norm? The respondents in this study disagreed (85%) that Extension only concentrates on male clientele. How does this finding compare to findings in other studies? They were in almost total agreement that Extension should educate entrepreneurs, yet very few had attended any Extension training sessions. What was the reason for this? Training not available to women? They were not aware of training? Too expensive in time or money? More research is needed on the important subject of Extension's role in educating women in Third World countries.

The Perceived Existing And Desired Management Systems Of The Mississippi Cooperative Extension Service And Their Relationship To Employee Motivation

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Introduction and Theoretical Framework

The United States Cooperative Extension Service's (Extension) organizational structure is characterized as a traditional and an industrial-age structure (Patton, 1987) which is derived from 19th century practices (Buford, 1990). In an industrial-age organization, managers are seen as the boss and everyone else as the subordinate (Buford, 1990). By contrast, an Extension professional's work is considered knowledge work and in this context Buford (1990) sees the workers as boss and the administrators and managers as facilitators. Extension professionals agree that society is no longer in an industrial-age, but rather in an information-age era (Apps, 1993; Buford, 1990; Patton, 1987). Moving the Extension organization into the future requires a leadership style with attributes compatible with an information-age organization (Patton, 1987).

Extension's traditional way of issuing rewards, motivation, and performance appraisal management, has been criticized by several authors (Buford, 1990; Patton, 1987; Rivera, 1990). Buford (1990) remarked that Extension can no longer manage its organization in its traditional ways. The Extension professionals' expectations have changed to the extent that they place a higher value on intrinsic rewards such as achievement, challenge, and personal growth and development, over traditional rewards such as promotion. Personal and social factors are significant as well in enhancing motivation (Marchant, 1982; McClelland, 1987).

Three decades ago Likert (1967) proposed a participative management organization which is applicable today if we desire to bring the management and leadership of our professional organizations up to date with that of an information-age organization. Likert (1967) conducted extensive research on examining the effect of management systems on employee attitudes and behavior which resulted in developing four management systems. The management systems ranged on a continuum from a most despotic and authoritative management structure to a most democratic and participative management structure. Likert (1967) termed the management systems as being System 1 -- exploitive authoritative, System 2 -- benevolent authoritative, System 3 -- consultative, and System 4 -- participative.

Statement of the Problem

As modern society enters the information age, some social scientists fear that the Extension organization structure is lagging behind and is in danger of remaining an industrial-age organization (Buford, 1990; Ezell, 1989; Patton, 1987). In an industrial-age organization, power, communication, and rewards are managed in traditional ways (Lawler, 1985; Sashkin, 1984). Leadership style is more autocratic than democratic and, as a result, communication is carried out in more of a top-down fashion (Likert, 1967). If Extension is indeed still an industrial-age organization, then it will tend to deal with employee motivation, reward, and promotion in a way which is incompatible with that of an information-age organization.

In order to change and improve an organization management system, it is essential to assess and identify the existing management system of the organization. Through the use of the Profile of Organizational Characteristics-Short form (POC-S), and by comparing the perceptions of several subgroups' Likert (1967) asserted that it is possible to measure the management system of an entire organization. This study utilized the Likert instrument to measure the perceived existing and desired management system of the Mississippi Cooperative Extension Service (MCES), so that any desired organizational improvement would be supported by research.

Purpose and Objectives

The primary purpose of this study was to measure the perceptions of the Mississippi Cooperative Extension Service (MCES) professional staff toward the organization's management system. Another purpose was to measure the professional staff members' self-perceived level of motivation and determine its relationship to the management system. The specific objectives were to

1. Determine the existing management system of the MCES as perceived by its professional staff.
2. Determine the management system desired by the MCES professional staff.
3. Determine if there is a difference between the perceived existing and desired management system in the MCES organization.
4. Determine the Extension professional staff members' self-perceived level of motivation.
5. Determine the relationship between the MCES management system (the perceived existing and desired) and the professional staff members' level of motivation.

Significance of the Study

The findings of this study would be instrumental in improving the existing management system of the MCES. The knowledge gained from this study in regard to motivation could be beneficial in MCES staff development activities. Current information about the relationship between motivation and management systems of the MCES has been very limited.

Methods And Procedures

The design of this study was descriptive-correlational. The MCES professional staff members' scores on management systems were correlated to their level of motivation.

Population

The MCES professional staff served as the population for this study. The most recent (as of June 1996) list of the MCES professional staff was used as a guide to identify the population. The members in the population consisted of administrative and supervisory staff, area directors, all state subject matter specialists, appropriate department heads, district leaders, home economists, 4-H youth agents, professionals in electronic and print media, and county extension agents. A total of 332 professionals made up the population for this study. Since the entire population was surveyed, sampling was not necessary.

Instrumentation

Two instruments were used to collect the data for the study. The Profile of Organizational Characteristics - Short Form (POC-S) (Likert, 1967); was used to gather data on perceived and existing management systems. A motivation instrument developed by Hackman, Lawler, and Porter (1977) was used to determine the MCES professional staff level of motivation.

The POC-S questionnaire, consisting of 18 questions, was used to determine the management system in the MCES. The POC-S was based on Likert's System 4 Theory. The POC-S allowed the employees to briefly describe the management system they perceived as being practiced in MCES, and gave them an opportunity to indicate which management system they desired in the future.

The reliability and validity of the POC-S instrument was established based on more than 250 studies in business and industry involving more than 200,000 employees and 20,000 managers (Likert, 1967). In a study of management styles in Georgia, Lind (1993) utilized the POC-S instrument and obtained a reliability coefficient of .95. In another study in Ohio, Ketchel (1972) correlated POC-S scores with performance in 17 counties and obtained an r of .83 for POC-S.

The responses on the questionnaire were converted to Likert's management system ratings. To facilitate the conversion, the following three steps were followed.

1. The overall mean of 18 questions was computed. The possible response to each question ranged from 1 to 20. A mean of 12 is adopted here to demonstrate the computation.

2. Means were transformed to a Likert System 4 using the following formula.
   E = (_) 4/20 + .5
   E = Existing management system (perceived)
   _ = The overall mean computed for each respondent
   Example: Given a mean of 12, E = (12) 4/20 + .5 = 2.9

3. To determine each system's rating the following assumptions were used:
   System 1 covers the range from .05 to 1.50, System 2 covers 1.51 to 2.50, System 3 covers 2.51 to 3.50, and System 4 covers 3.51 to 4.50 (Likert, 1967).
   Example: 2.9 = System 3 = Consultative.

The motivation instrument used in this study was based on the principle of expectancy theory and developed by Hackman, Lawler, and Porter (1977). The reliability and validity of the instrument were established in a recent study using the same population (Newman & Djire, 1996). This instrument consists of three major components. The first one concerns performance to outcome expectancies (P-O) which implies that an individual expects to get something in return for a certain behavior. The second component concerns the valences of the outcomes (V) which is a subjective value that an individual gives to an outcome. The third one deals with effort to performance expectancy (E-P). The first and second parts of the questionnaire each had a set of 19 questions and the third part had three questions. The motivation scores were computed as follows.

1. The average expectancy times valance = (Q1p1 X Q1p2) + (Q2p1 X Q2p2) + (Q3p1 X Q3p2) + . . . (Q19p1 X Q19p2) / 19

2. The average effort to performance = Q1p3 + Q2p3 + Q3p3 / 3

3. Motivation score = The average expectancy times valence (the result of step 1) X the average effort to performance (the result of step 2). In the above notations Q = question, and p = part.

Pilot Study

Since the entire MCES professional staff was in the population of the study, the professional staff of the Purdue University Cooperative Extension Service (PUCES), a similar population, served as the population for the pilot study. Thirty-four members with e-mail addresses were randomly selected for the pilot study. The subjects were given the choice to reply via e-mail or postal service. Ninteen responses were received, four mailed their responses via postal mail and 15 transmitted via e-mail, yielding a 56% response rate.

Reliability coefficients (Cronbach's alpha) of .92 and .87 were obtained on the management scale for the existing and the desired management systems, respectively. On the motivation instrument, reliability coefficients (Cronbach's alpha) of .93, .76, and .86 were obtained, respectively, for parts 1, 2, and 3.

Variable Transformation

The dependent variables in this study included motivation score, the perceived existing management system, and desired management system. The independent variables selected were based on a literature review. The demographic data which included age, gender, marital status, position (official title), education level, salary, years worked for the MCES, and years at the current position were considered as independent variables.

The variable position was divided into state/area level staff and county level staff. The state/area staff consisted of administrative and supervisory staff, area directors, all state subject matter specialists, appropriate department heads, and district leaders. The county staff consisted of county extension agents, 4-H youth agents, home economists, and the professionals in electronic and print media. The participants' official position on the organizational chart determined whether they belonged at the state/area level or county level.

Data Collection

Data collection for this study was conducted both via electronic (e- mail) and postal mail. E-mail addresses of the professional staff in the population were gathered from the updated MCES personnel directory. A personalized electronic cover letter along with the instrument were mailed to each member of the population. The participants were given a choice to respond either via e-mail or postal mail. After two follow-ups a total of 216 responses were received with 197 usable responses, yielding a response rate of 65.1%. The majority of the participants (70%) returned their responses via postal mail and 30% transmitted via e-mail. A greater percentage of state/area staff (64.4% or 38) than county staff (13.4% or 17) transmitted their responses via e-mail.

To account for non-response errors, Miller and Smith (1983) suggested that respondents be dichotomized into those who responded early and those that responded late. The two groups, then, could be compared statistically on selected variables to determine differences between the groups. This technique was used because the non-respondents could not be identified due to shared e-mail addresses at the county level. No statistically significant differences were found between the two groups on the motivation level and the desired management system. There was a statistically significant difference found between the two groups on the existing management system which implies that the results of the study regarding the perceived existing management system should be viewed with caution.

Data Analysis

The data collected from this study were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows (Norusis/SPSS Inc., 1994). Descriptive statistics were used to describe and summarize the participants personal characteristics. Pearson Product-Moment Correlation coefficients were computed to describe the strength and nature of relationship of motivation to management systems. No inferential statistical analysis were done because this was a census study.

Findings and Discussion

The mean age of the participants was 43.38 years with a standard deviation of 8.19. Nearly two-thirds (62.6%) of the respondents were males and 37.4% were females. More than two-thirds (82%) of the respondents were married and 8.9% were single. More than half (52.4%) of all the respondents held a Masters while 19.8% held a Ph. D. degree. There were 41 (21.9%) with a Bachelors and 11 (5.9%) with high school Diplomas. More than two-thirds (68.3%) of the respondents were in county level staff positions while 31.7% were in state/area positions. The mean years of service in the MCES was 12.38 with a standard deviation of 7.93. The mean years of service in current position was 7.54 with a standard deviation of 6.23.

Objective One

The mean for the existing management system as perceived by the MCES professional staff was 9.40 (9.40 X 4/20 + .5 = 2.38 = System 2) with a standard deviation of 3.31. This indicates that the perceived existing management system of the MCES is a System 2 which is a benevolent authoritarian (BA) organization. In a BA management system the leadership is more autocratic and communication within the organization is more top-down. While the bulk of the decisions and goal setting of the organization are made at the top, many decisions are made within a prescribed framework at lower levels.

Objective Two

The results of the study showed that the mean for the desired management system as indicated by the MCES professional staff was 15.25 (15.25 X 4/20 + .5 = 3.55 = System 4) with a standard deviation of 3.01. This indicated that the professional staff members desired a participative management (PM) organization. In a PM system the leadership has complete confidence and trust in subordinates. The findings implies that the professional staff members desire to work in an environment where decision making is widely dispersed throughout the organization, communication flows not only up and down the hierarchy but among peers, and emphasis is placed on intrinsic rewards rather than traditional ones.

Objective Three

From the data recorded in Table 1, it is observed that the professional staff members perceived the MCES to be a System 2 while they desired a System 4 organization. This implied that while the professional staff members perceived the existing management system as benevolent authoritarian they desired a particiapative management system for the MCES. The professional staff members want to see the MCES organization changed to a participative management organization.

Table 1

The Perceived Existing and Desired Management Systems of MCES.

Variable	n	Converted mean	SD	System
Existing Management System	193	2.38	3.31	2
Desired Management System	193	3.55	3.01	4

The identification of the perception of various subgroups within an organization provides valuable information regarding two organizational objectives. First, the perceptions and desires of a subgroup might bring about information regarding any resisting forces within the organization in regard to changes in management system that may come about as a result of an organizational development. Second, it may aid in designing different training programs based on subgroups' needs and potentials.

Table 2 presents the mean scores of the perceived existing and desired management systems for the population subgroups. The data revealed that the state/area level staff perceived the existing management system of the MCES to be a System 2 while the county level staff perceived a System 3 organization. The relationship of an employee to his/her superior plays an important role in making any evaluation and characterization about the organization's management system. Thus, some of the reasons for this variation between these two levels of staff might be found by analyzing the formation of these two subgroups. There are considerable numbers of middle and top managers in the state/area level of the professional staff. The lower perception of the existing management system among this group might be due to the influence of the authoritarian leadership style of the top managers. By the same logic, the higher perception of the county staff might be due to the consultative leadership style of the middle managers who supervise the staff at this level.

Table 2

The Population Subgroups on Existing and Desired Management System.

	Existing Management System				Desired Management System			
Variable	n	Mean	SD	System	n	Mean	SD	System
Professionals								
County staff	127	2.52	2.87	3	123	3.57	3.20	4
State staff	59	2.10	3.49	2	59	3.51	2.75	4
Gender								
Female	73	2.46	3.12	2	71	3.52	3.57	4
Male	122	2.32	3.32	2	120	3.55	2.65	4
Marital St.								
Married	156	2.39	3.26	2	153	3.53	3.19	4
Single	17	2.51	3.44	3	16	3.74	1.88	4
Divorced	12	2.20	2.97	2	12	3.63	1.78	4
Widowed	5	2.12	3.18	2	5	3.39	1.75	3
Education								
Ph.D.	37	2.07	3.44	2	37	3.49	3.23	3
Masters	98	2.31	3.21	2	97	3.67	2.07	4
Bachelors	41	2.71	2.70	3	38	3.44	3.69	3
Diploma	11	2.63	2.65	3	11	3.25	4.59	3

Objective Four

The mean motivation score of the participants was 22.12 with a SD of 9.76. Fifty-two percent of the respondents scored below the mean and 48% scored above the mean (22.12). The MCES professional staff members' self-perceived level of motivation ranged between 2.42 and 54.32. The maximum obtainable score on the instrument was 60. The mean motivation score of the MCES professional staff was lower than what was reported by Newman and Djire (1996). This has staff development implication and should concern the leadership of the organization.

Objective Five

Pearson Product-Moment correlation coefficients were used to measure the relationship between the level of motivation and management system. The results yielded a Pearson coefficient of .19 between the MCES professional staff level of motivation and the perceive existing management system which implied a low positive association (Davis, 1971). This indicated that as the respondents' perception of existing management system improved along a continuum from System 1 toward a System 4, the professional staff members' level of motivation increased at a low rate. A Pearson coefficient of .14 was obtained (Table 3) for the correlation of the professional staff members' level of motivation and the desired management system. This also implied a low positive association (Davis, 1971). This relationship indicated that as the professional staff members' view on the desired management system improved toward a System 4, the respondents' level of motivation increased slightly.

Table 3

Correlation of Motivation and Management Systems (n=192).

Variable	Y1	Y2	Y3	Mean	SD
Motivation (Y1)	1.00	.19	.14	22.20	9.65
Existing Management System (Y2)		1.00	.32	9.40	3.32
Desired Management System (Y3)			1.00	15.26	3.01

Conclusions

1. The MCES epitomizes a typical bureaucratic organization where rewards and motivation are dealt with in a traditional manner. The MCES could be characterized as a benevolent authoritative (by Likert classification of management system) organization where most of the decision making and goal setting are done at the top of the organization.

2. The MCES organization has a great potential to become a participative management system because the subgroups of the professional staff favor a management system based on a participative style. The process of change toward participative management may not encounter any resistance because the professional staff desired a participative management system.

3. The professional staff members' level of motivation could not be greatly enhanced by improving the existing management system of the MCES.

4. The professional staff members' level of motivation did not increase since 1994. The Djire (1994) study reported a higher level of motivation for the similar population utilizing the same instrument. The MCES, being a benevolent authoritarian organization, places major emphases on traditional methods of issuing rewards rather than intrinsic methods.

Recommendations

1. Since it was established that the existing management system of the MCES is a System 2 organization, programs should be devised to move the existing management system toward a System 4 organization that is desired by the professional staff.

2. Administrators throughout the organization should receive training on skills needed to implement a participative management system. Some of the major skills in a participative management system include group goal setting, group decision making process, and group interaction and communications. In training programs professional staff and managers who practice consultative or participative management styles at their departments should be used as support and resource persons.

3. A longitudinal study should be conducted within the next three to five years to check the progress toward reaching the management system desired in the MCES.

4. The leadership of the MCES should incorporate intrinsic motivation and place less emphasis on the traditional methods of issuing rewards. Intrinsic motivation is a feature of a System 4 organization which the MCES professional staff desired.

5. Research should be conducted to identify variables that could enhance the MCES professional staff members' motivation.

6. Major attention in staff development training programs should be focused on the training needs of the professionals in management and leadership positions because they are the key to the implementation of a participative management system and they form the linking-pins for the leadership of the organization.

Implications

There are number of implications for the MCES as a result of this study. Initiating a process of organizational improvement and most particularly a change toward a participative management system (what was desired by the staff) requires that the leadership of the MCES adopts a participative management principal. To facilitate this process, convincing responses to a number of questions are required. The reasoning and logic might become apparent as a result of a debate on this topic among the professionals. Some of these questions might be as follows: (a) What measurable improvement should result from a participative management system? (b) How efficient is the participative management in dealing with day to day activities in the organization? (c) How effectively might our clienteles be served by a participatory management style? Responses to questions like these and others would facilitate the adoption of a participative management system and initiate a process for organizational improvement.

A change from a System 2 to a System 4 is slow and time consuming. Some experts predict that it might take 3 to 5 years. So, the implication is that it requires patience and steadiness. Experts on the system 4 management system for training programs and a substantial amount of educational material (print and audio visual materials) are required to educate the staff. Thoughts should be given to ways to allocate financial resources to cover expenses for the training programs.

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The Perceived Existing and Desired Management Systems of the Mississippi Cooperative Extension Service and Their Relationship to Employee Motivation

A Critique

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This study asked Extension professionals about existing management systems and what kind of management system they desired. Their management system responses were compared with their levels of motivation and a very low relationship existed. As their perceptions of existing and desired management moved toward a more participative system, their motivation increased.

Research areas related to Extension employee motivation have received attention within the agricultural education profession. For example, there have been studies on job satisfaction of Extension personnel and leadership styles of Extension administrators. This research would be stronger if it built upon some of the related research within the profession.

I commend the researchers for using reliable instruments that had been developed and used in previous studies and for conducting a careful pilot test. If the researchers could not identify the respondents because the survey was done over e-mail, how did they manage the follow up requests?

If motivation increases only slightly with a move toward a more participative management style, what is the rationale for changing the organization toward that? Just that people have said they want it? Or that participation and empowerment is the style currently in vogue?

What are some of the reasons that motivation has not increased since the 1994 study? Why were two studies of the same audience conducted close together, (just two years apart)? Was there a concerted effort by Mississippi Extension to increase motivation? If so, what measures were taken?

The ratings between existing and desired systems in this study seem to be far apart. But assume that the ratings had been 2.50 for the existing system (within the System 2 range) and 2.51 for the desired system (within the System 3 range). A test of significance to see if the differences between the ratings were real or occurred just by chance is needed as evidence that there was a desire to move from one management system to another.

The researchers state that no inferential statistics were done because it was a census study, but if results are to be generalized to the total population from the 65% who responded, inferential statistics are necessary.

Concurrent Session K

Theme:
Youth
Leadership

Chairperson:
Susan S. Camp
SUNY-Oswego

Discussant:
Barbara M. Kirby
North Carolina State Univ.

Facilitator:
Kirk A. Swortzel
Auburn University

A Comparative Study of Self-Perceived Leadership Skills Based on Gender
Christine Townsend, Texas A&M University
Laurie Thorpe, Texas A & M University

A Profile of the Program of Activities Use by FFA Chapter Advisors
Robert M. Torres, New Mexico State Univ.
Thomas J. Dormody, New Mexico State Univ

Students' Perceptions of Block Scheduling in Agricultural Education
Jennifer Wortman, North Carolina State
Gary E. Moore, North Carolina State
Jim Flowers, North Carolina State

Youth Leadership Development: How Much Do We Know?
Gary J. Wingenbach, West Virginia Univ.
Alan A. Kahler, Iowa State University

A Comparative Study Of Self-Perceived Leadership Skills Based On Gender

Christine Townsend
Texas A&M University

Laurie Thorp
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Introduction

As more and more women entered the workplace and assumed positions of leadership in traditionally male dominated institutions and businesses, leadership educators needed to assess whether they were adequately preparing young women to succeed as leaders. Aburdeen and Naisbitt (1992) stressed the importance of this changing scenario not be ignored, underestimated or misunderstood. Fritz, Brow, Lunde and Banset (1996) agreed that it was critical to understand the changes and events related to gender, and to understand what both sexes could do to insure the likelihood of success in their professional careers.

However, individual success for women was only a part of the situation. The emergent view of organizational leadership recognized the need for a more nurturing or "feminine" style (Lee, 1994). Leadership was evolving from its patriarchal roots to the emerging paradigm of a web-like network of shared leadership. With this new model leaders are expected to develop a shared vision, build community, foster dialogue and nurture collective capability. This shift away from hierarchical, task-driven organizations created even greater opportunity for women (Helgesen, 1990; Aburdeen & Naisbitt, 1992). The door opened for a model of partnership, based on linking rather than ranking (Block,1993). However, preparation of young women leaders needed for this organizational transformation may require changes in our educational methodologies. The literature clearly showed that our classroom settings were largely based on theories and practices which were often ineffective and directly counter to the ways women learn and develop.

In addition, leadership scholars warned that in order for organizations to survive in times of rapid change, organizations needed to become learning or knowledge based organizations that fostered an environment receptive to growth, risk and creativity (Senge, 1990; Bridges, 1995). The success of an organization in the 21st century will be marked by its ability to learn together (Senge, 1990). "The emerging model values the developmental learning process. This always starts with the individual, then moves to the individual in relationship, and finally moves to the relationships in the organization" (Smith, 1995, p.207). If women were to fully participate as leaders within learning organizations, educators needed to understand gender-specific ways of learning. Viewed through the female developmental lens, leadership instruction may be different for women than it is for men.

Theoretical Framework

Women as Leaders

As leadership scholars called for a more relational model, women's particular strengths were increasingly valued. The literature clearly revealed several traits typically associated with women. Eagly and Johnson (1990) found in their meta-analysis of leadership style that women employed a more democratic or participative style than men. Sally Helgesen's study (1990) of female executives found that women led by building relationships, sharing information, and fostering an atmosphere of inclusion. Smith and Smits (1994) noted that, "We need to encourage feminine styles of leadership, not to replace, but to balance masculine styles" (p.46).

Many authors examined not the leadership style that women brought to an organization, but rather the inner traits they possessed to succeed. Astin and Leland (1991) discovered several shared qualities among women leaders including: intellectual competence, assertiveness, personal awareness, and confidence. Cantor and Bernay (1992) also found that a woman's confidence in her own abilities was crucial to success. The authors developed a leadership equation for women which included "competent self" as a key factor. This competent self implied that women must have a strong sense of self which was not defined by other people or institutions. In his book The Fifth Discipline, Peter Senge (1990) included personal mastery as one of the four core disciplines for a learning organization.

Development of Self, Women's Epistemology

Developmental theorist Carol Gilligan (1982) found, for women, that forging a sense of self could be problematic. Gilligan showed that feminine identity was threatened by separation. Conversely, male ego boundaries were defined through separation. Gilligan challenged the psychological literature on moral development that equated increased development with increased separation. The author discovered that very often for women, moral "goodness" meant self-sacrifice, hindering development. Women judged themselves by their care and concern for others, resulting in a constant tension between doing for others and fulfilling their own potential. Whereas men resolved this conflict with a hierarchical ordering, women saw a network of relationships on whose continuation they all depend. This paradox clearly presented a predicament for women in leadership development.

Gilligan found that an integral part of women's development of self, or "voice," was claiming her own intelligence. Belenky, Clinchy, Golberger, and Tarule (1986) sought to examine the experiences of women as learners in relation to their changing concepts of self. Based on the epistemological study of William Perry (1981), Belenky et al. traced the sequence of passage that gave meaning to women's educational experience. Building on Perry's scheme, the authors grouped their findings into five major epistemological stages: (1) silence, a position in which women have little awareness of their intellectual capabilities; (2) received knower, women conceive of themselves as capable of receiving knowledge from external authorities; a sense of self is externally defined; (3) procedural knowers, a sense of self arises from identification with the power group; (4) subjective knowers, quest for self is primary, which often means turning away from authority, resulting in a private sense of authority; there is no public voice; (5) constructed knowers, an integration of subjective and objective knowing;these women experience themselves as creators of knowledge. Unfortunately, our educational institutions did not adequately serve the needs of women and , "...faculty usually assume that pedagogical techniques appropriate for men are suitable for women" (Belenky et al., 1986, p.5

Numerous studies found very clear evidence that the public educational system was not meeting women's needs. Sadker and Sadker (1994) found that women were twice as likely as men to be silent during class discussions. Krupnik (1985) described the college classroom as one where men performed and women watched. Men talked longer and were more likely to interrupt. When women did speak, self-doubt frequently compromised the power of their statements (Tannen, 1990). Tannen summarized that, "ways of talking associated with masculinity are also associated with leadership and authority" (p. 240). However, following Gilligan's thesis, if a woman adapted her style of communication to a position of authority she risked compromising her sense of self. Horner (1972) found that women appeared to have a problem with competitive achievement, especially against men, and that problem emanated from a perceived conflict between femininity and success.

The All Female Learning Environment

The literature offered evidence that a single-sex classroom provided female students with an environment that encouraged participation. Females receiving single-sex instruction had higher self-esteem, had more positive attitudes about academics, were more confident in their ability to perform in non-traditional subjects, and had higher academic achievement (Grossman & Grossman, 1994; Sadker & Sadker; Lee, Marks, & Byrd, 1994). Although academic achievement was perhaps the most compelling argument for the single-sex

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classroom, individual preference was also considered. Aries (1976) discovered that over time women preferred an all female grouping over a mixed sex grouping. Keohane (1991) suggested that all female classrooms sustained a sense of connectedness that women need to develop their voice as leaders.

Purpose of the Study

The purpose of this study was to: 1) examine the differences of self-perceived leadership skills between men and women who elected to take a collegiate leadership course; 2) determine if a relationship existed between women's previous leadership experiences and their self-perceived leadership skills; and 3) examine the differences of self-perceived leadership skills between women in an all female educational setting and women in a coeducational setting.

Based on the purposes of this study, the following six hypotheses were formulated and tested statistically:

H_{01}= There is no difference between female's and male's self-perceived leadership skills prior to a collegiate leadership course.

H_{02}= There is no difference between female's and male's self-perceived leadership skills following a collegiate leadership course.

H_{03}= There is no relationship between a female student's prior leadership training and self-perceived leadership skills prior to a collegiate leadership course.

H_{04}= There is no relationship between a female student's prior leadership training and self-perceived leadership skills following a collegiate leadership course.

H_{05}= There is no difference in self-perceived leadership skills by females enrolled in the all female section and females enrolled in the coeducational section prior to a collegiate leadership course.

H_{06}= There is no difference in self-perceived leadership skills by females enrolled in the all female section and females enrolled in the coeducational section following a collegiate leadership course.

Procedures

Population/ Sample Design

The population for this study consisted of students who enrolled in collegiate academic leadership classes. The sample consisted of students who enrolled during the 1996 Fall semester, in Agricultural Education 340, Professional Leadership Development, at Texas A&M University (n=200). Purposive sampling was employed in the study. The logic and power of purposive sampling lies in focusing in-depth on on a small number of information rich cases that fit the purpose of the study (Patton, 1990; Babbie, 1992). H_{05} and H_{06} utilized a subset of the sample, only students that registered for the all female laboratory section (n=20) or the coeducational laboratory section (n=20) were included in this part of the study.

A correlational design was used for this study. The dependent variable was the Leadership Skills Inventory (LSI) score. The independent variables were: gender, and previous leadership experience. Since random assignment was not possible (students self-selected into the various sections of the course) the research design is quasi-experimental.

The laboratory experiences of the experimental (all female) and the control group (coeducational) were kept as identical as possible, with the exception that the experimental group was exposed to the treatment (all female classroom setting). The principle investigator taught both the control and experimental sections to eliminate any possible teacher effect for this part of the study. Identical experiential learning activities were used in all laboratory sections.

Data Collection

The instrument used to assess the students' self-perception of leadership skills was the Leadership Skills Inventory (LSI), developed at Iowa State University in 1980 by Carter and Townsend (Townsend, 1981). The LSI contained 21 statements describing various leadership and life skills. These statements corresponded to five internal scales for analysis. The five internal scales were: (1) Working with Groups, (2) Understanding Self, (3) Making Decisions, (4) Communicating and (5) Leadership. Responses were measured on a five point Likert-type scale. The reliabilities for the five scales were as follows: Communicating (.73), Working with Groups (.75), Making Decisions (.63), Leadership (.83), and Understanding Self (.67). The LSI survey (pretest) was administered to all students enrolled in the leadership course during the first week of Fall semester 1996, and again (posttest) on the last week of classes. All data were collected in the lecture setting.

Results and Findings

A t-Test for independent means was used to test hypotheses one and two. These hypotheses were tested to determine the difference between female's and male's self-perceived leadership skills prior to (Table 1) and following (Table 2) a collegiate leadership course. Means of all five LSI measurement scales were compared for male and female students. There were no statistically significant differences between men and women for all five LSI measurement scales prior to and following the course. Men and women who elected to take a collegiate leadership course had the same self-perceptions of their abilities to work with groups, understand themselves, communicate, make decisions, and lead.

Table 1.
t-Test for Independent Means of Male and Female Self-Perceived Leadership Skills Prior to Training (α=.05)

Scale	n	Mean[1]	SD	2-Tail Prob
Working with Groups				.36
male	94	4.37	2.17	
female	87	4.42	1.84	
Understanding Self				.10
male	92	4.52	1.68	
female	87	4.44	1.87	
Communicating				.95
male	94	4.28	1.90	
female	87	4.27	1.66	
Making Decisions				.62
male	94	4.37	1.40	
female	87	4.34	1.50	
Leadership				.54
male	94	4.10	3.30	
female	87	4.06	2.96	

Note: [1]Means were adjusted for missing values. 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1=strongly disagree. Scale means created by dividing grand means by number of scale items.

Table 2.
t-Test for Independent Means of Male and Female Self-Perceived Leadership Skills Following Training (α=.05)

Scale	n	Mean[1]	SD	2-Tail Prob
Working with Groups				.82
male	80	4.38	2.44	
female	79	4.40	2.37	
Understanding Self				.79
male	80	4.53	1.90	
female	79	4.51	1.89	
Communicating				.58
male	79	4.37	1.97	
female	79	4.41	1.79	
Making Decisions				.56
male	80	4.46	1.22	
female	79	4.42	1.43	
Leadership				.94
male	79	4.29	3.22	
female	79	4.28	3.05	

Note: [1]Means were adjusted for missing values. 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1=strongly disagree. Scale means were created by dividing grand means by number of scale items.

Pearson's Product Moment correlation coefficient was used to test hypotheses three and four. These hypotheses were tested to determine if a relationship existed between female students' *previous* leadership training and their self-perceived leadership skills prior to or following the course. Correlations were made between the five Leadership Skills Inventory measurement scales and four different categories of previous leadership experience. The four categories of previous leadership experience included: leadership courses in high school, leadership courses in college, leadership activities in high school, and leadership activities in college.

Prior to Course

A statistically significant relationship was found between participation in high school leadership courses and the LSI Leadership scale. This correlation indicated that the more leadership *courses* a woman took in high school, the stronger she perceived her ability to lead. Statistically significant relationships were found between participation in high school and collegiate leadership *activities* and the LSI Leadership scale. These correlations indicated that the more academic leadership *activities* a woman participated in, the stronger she perceived her ability to lead. There were no other statistically significant correlations found between previous leadership experience and self-perception of leadership skills. This indicated that a woman's previous leadership experience had no relationship to her perceived ability for working with groups, understanding self, communicate, or making decisions. A summary of the results is reported in Table 3.

Table 3.
Relationships Between Previous Leadership Experience and Self-Perceived Leadership Skills[1]-Prior to Training (n=87)

Experience[2] Scale	High School Leadership Courses	Collegiate Leadership Courses	High School Leadership Activities	Collegiate Leadership Activities
Working with Groups	r =.008 p=.94	r =.15 p=.16	r =.14 p=.21	r =.06 p=.61
Understanding Self	r = -.06 p=.62	r = -.06 p=.62	r= -.002 p=.99	r = -.06 p=.59
Communicating	r =.05 p=.64	r = -.08 p=.45	r =.11 p=.31	r =.05 p=.68
Making Decisions	r = -.11 p=.30	r =.04 p=.71	r = -.06 p=.59	r =.11 p=.33
Leadership	r =.22* p=.04	r =.10 p=.36	r =.35* p=.001	r =.23* p=.04

Note: *Indicates a significant relationship at alpha=.05. [1]Adjusted for missing cases. [2]A (0 courses or activities)=0, B (1-2 courses or activities)=2, C (3-4 courses or activities)=4, D (5-6 courses or activities)=6, E (7 or more courses or activities)=7.

Following the Course

Following the course , statistically significant relationships were found between a woman's perceived ability to lead and previous academic leadership courses and activities. These results indicated that following leadership training, women recognized the value of their leadership courses and activities and indicated these past experiences developed their ability to lead.

Additionally, posttest correlations revealed statistically significant relationships between participation in high school and collegiate leadership courses and the LSI Working with Groups scale. These correlations indicated that the more academic leadership courses a woman took, the stronger she perceived her ability for working with groups. No other significant relationships were found in the correlations. The other elements of the leadership composite were not statistically related to previous leadership courses or activities. Therefore, even after training, women's self-perceptions of their abilities to understanding self, communicating and making decisions were not related to their past leadership experiences. A summary of results is reported in Table 4.

Table 4.
Relationships Between Previous Leadership Experience and Self-Perceived Leadership Skills[1] Following Training (n=79)

Experience[2] Scale	High School Leadership Courses	Collegiate Leadership Courses	High School Leadership Activities	Collegiate Leadership Activities
Working with Groups	r = .20** p=.08	r = .21** p=.07	r = .20 p=.08	r = .10 p=.37
Understanding Self	r = .07 p=.53	r = -.04 p=.74	r = .01 p=.91	r = -.01 p=.90
Communicating	r = .14 p=.21	r = .002 p=.99	r = .10 p=.37	r = .17 p=.13
Making Decisions	r = -.008 p=.94	r = .06 p=.56	r = -.03 p=.83	r = .15 p=.18
Leadership	r = .36* p=.001	r = .23** p=.05	r = .35* p=.001	r = .30* p=.008

Note: *Indicates a significant relationship at alpha=.05. **Indicates a significant relationship at alpha=.10. [1]Adjusted for missing cases. [2]A (0 courses or activities)=0, B (1-2 courses or activities)=2, C (3-4 courses or activities)=4, D (5-6 courses or activities)=6, E (7 or more courses or activities)=7.

A t-Test for independent means was used to test hypotheses five and six. These hypotheses were tested to determine any difference in self-perceived leadership skills by females enrolled in the all female section and females enrolled in the coeducational section prior to and following a collegiate leadership course. Means of all five LSI measurement scales were compared for the all female (treatment) and coeducational (control) laboratory sections. There were no statistically significant differences between the groups of women in the two sections *prior* to the treatment, as reported in Table 5.

Means of all five LSI measurement scales were compared for the all female (treatment) and coeducational (control) laboratory section *following* the course. Statistically significant differences were found between the means of the groups for all five LSI measurement scales. Following the leadership course, women in the all female section had stronger perceptions of their abilities to work with groups, understand self, communicate, make decisions, and lead than women in the coeducational section. A summary of the results is reported in Table 6.

Table 5.
t-Test for Independent Means of the All Female and Coeducational Sections Self-Perceived Leadership Skills Prior to Training (α=.05)

Scale	n	Mean[1]	SD	2-Tail Prob
Working with Groups				.19
all female	19	4.53	1.77	
coeducational	16	4.35	2.11	
Understanding Self				.35
all female	19	4.47	1.42	
coeducational	16	4.58	1.75	
Communicating				.36
all female	19	4.24	1.35	
coeducational	16	4.13	1.51	
Making Decisions				.81
all female	19	4.30	1.82	
coeducational	16	4.25	1.69	
Leadership				.63
all female	19	3.95	2.45	
coeducational	16	3.88	2.86	

Note: [1]Adjusted for missing cases. 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1=strongly disagree. Scale means created by dividing grand mean by number of scale items.

Table 6.
t-Test for Independent Means of the All Female and Coeducational Sections Self-Perceived Leadership Skills Following Training

Scale	n	Mean[1]	SD	2-Tail Prob
Working with Groups				.003*
all female	18	4.71	1.38	
coeducational	16	4.24	2.56	
Understanding Self				
all female	18	4.71	1.34	.06**
coeducational	16	4.50	1.75	
Communicating				
all female	18	4.57	1.45	.04*
coeducational	16	4.22	2.25	
Making Decisions				
all female	18	4.56	1.19	.04*
coeducational	16	4.23	1.49	
Leadership				
all female	18	4.45	2.25	.01*
coeducational	16	4.05	2.89	

Note: [1]Adjusted for missing values. 5=strongly agree, 4=agree, 3=undecided, 2=disagree, 1=strongly disagree.
*Indicates significant at alpha=.05. **Indicates significant at alpha=.10.

Conclusions

Following 13 weeks of leadership development lectures and simulation activities, male and female students had the same self-perception of leadership skills. This result indicated that the social structure of the classroom did not have any adverse effect on women's leadership development from the activities, *when compared to men*. These findings contradicted what numerous authors found occurring in the collegiate classroom, that is, a setting where women watched and men performed (Sadker & Sadker,1994; Krupnik,1985; AAUW,1992). However, it should be noted that very different conclusions were made when comparing women in the coeducational sections with the women in the all female section.

Findings from testing hypotheses three and four indicated that there was little continuity or connection between women's previous leadership experiences and their present self perception of leadership skills. Since no relationships were discovered for the four LSI scales: Working with Groups, Understanding Self, Communicating or Making Decisions, it appeared that past leadership experiences did not help women become more confident in these areas. These results could be due to the fact that the previous experiences had no stability over time, reinforcing what Brungardt (1996) concluded that more research is needed to evaluate what methods influence long term growth and development in leadership. These findings could also be attributed to a lack of effective training activities that address issues such as understanding self or making decisions. This would be in agreement with Belenky, Clinchy, Goldberger and Tarule (1986), who found that women often experienced formal education as peripheral or irrelevant to their central interests and development. The presence of a significant correlation between previous experience and the LSI Leadership scale indicated that leadership courses and activities were primarily focused on the development of leader-centered skills from the "old" leadership paradigm.

Finally, these findings indicated that an all female classroom was superior to a coeducational setting for collegiate women in the development of working with groups, making decisions, communicating, understanding self and leadership. This portion of the study reinforced Belenky, Clinchy, Goldberger, and Tarule's (1986) conclusion that women enter the classroom with gender-specific needs. Further, the current study echoed Murry's (1992), conclusion that there were gender-specific needs for learners of *leadership*. In the current study, it appeared these needs were not being met in a coeducational setting. This study supported the research of numerous authors (Sadker & Sadker, 1994; Lee, Marks, & Byrd, 1994) that found females in an all female classroom were more confident in their ability to perform academically. Belenky et al (1986) put forth that, "it is exactly these kinds of relationships that provide women with the experiences of mutuality, equality, and reciprocity that are most helpful in eventually enabling them to disentangle their own voice from the voices of others. It is from just such relationships that women seem to emerge with a powerful sense of their own capacities for knowing" (p.38).

Recommendations

1. The addition of an all female laboratory section may be appropriate for leadership courses taught at similar institutions that develop the five skill areas examined in this study.

2. It is recommended that collegiate leadership courses incorporate more activities that allow women to have opportunities to make decisions, defend their choices, and take responsibility for the outcome.

3. It is recommended that collegiate leadership facilitators receive more training in the development of understanding self, communication, making decisions and working with groups.

4. A qualitative evaluation of women's experiences in a collegiate leadership course should be conducted to further determine stakeholder's needs in leadership development methodology.

5. More research is recommended to determine the benefit of gender-specific settings in other types of leadership training programs.

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A Comparative Study of Self-Perceived Leadership Skills Based on Gender

A Critique

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I commend the authors on an outstanding paper that was particularly interesting to read. We are observing an increasing number of women in corporate leadership, in higher education administration and in youth as well as adult organizations. The major focus of the paper was to compare self-perceived leadership skills based on gender. However, one of the most important implications of the study is that leadership education needs to change for future leaders regardless of gender because the leadership paradigm has changed.

The paper is very well organized and written in a scholarly manner. The lead author is well known for her contributions to leadership education. This research is well grounded in a relevant literature base and strong theoretical framework. Hypotheses are clearly stated and the procedures appropriate. I commend the researchers for using their classroom and laboratories for conducting pragmatic research that impact practice. The research also built on previous studies and used tested instrumentation. As the course progressed, n changed from 200 to 181. Fourteen males and eight females dropped out of the study. Did this attrition have any impact on the study? Also, the treatment group included 19 females and the control group included 16 students. Were the sixteen all female and if so how many more students in the control group were males. The Leadership Skills Inventory (LSI) was developed in 1980. While the subsections of the instrument include five relevant leadership skills areas, I wonder if any adjustments in the text needed to be made given the 1990s shifting approach to leadership development. Were other instruments considered for use?

The authors stated that men and women who elected to take the collegiate leadership course had the same perceptions of their abilities to work with groups, understand themselves, communicate, make decisions, and lead prior to and after the course. Did the authors consider measuring the impact of the course itself using pre and posttest scores? It appears that students do recognize the benefits from generic leadership training and experiences and perceive themselves as leaders. It is interesting that after the course, the only other significant relationship (besides the leadership scale) between previous leadership experience and self-perceived leadership skills occurred between Working with Groups and high school courses and college courses. Why were there little to no relationships between the courses and activities and the other scales: understanding self, communicating, and making decisions after the course? How could the course be taught differently to address these areas? Certainly the training of leadership facilitators in these areas as the authors recommend could have an impact.

Females who participated in the all-female sections perceived themselves significantly different than those in the coeducational group. Would an all-male group have been significantly different from males in the coeducational group? I encourage the authors to continue researching the need to deliver instruction with student differences in mind. I hope their future research, particularly qualitative research, will tell us how to help our future leaders communicate better, understand themselves, and make better decisions.

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A Profile of the Program of Activities Use By FFA Chapter Advisors

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Introduction

Like all vocational-technical education teachers, a basic responsibility of the agricultural education teacher is to integrate their vocational student organization (VSO), the FFA, into their educational program to "provide students with opportunities to apply learned skills, develop leadership abilities, and gain recognition" (Smith & Edmunds, 1995, p. 29). In doing so, they agree to serve as a FFA chapter advisor. This role includes "supervising the development, publication, and implementation of a yearly plan of activities" (also known as a program of work, program of activities, or POA) and "supervising a yearly evaluation of the vocational student organization program" (Vaughn, Vaughn, & Vaughn, 1993, p. 11). A comprehensive POA provides for yearly planning, implementing, and evaluating of the FFA program (National FFA Organization, 1995a). McCall and Bartlett (1992) mentioned that having a current POA on file in the state FFA office is a requirement in most states.

Throughout the literature, there appears to be agreement on the definition of a program of activities (POA). For example, it has been defined by the Center on Education and Training for Employment (1992, p. 7) as "a written plan listing the activities a local VSO chapter plans to accomplish during the year." Phipps and Osborne (1988, p. 393) defined it as "an annual written plan of goals and activities to be undertaken by the membership." Vaughn, Vaughn, and Vaughn (1993, p. 40) called it "a written plan, developed and published yearly, of all activities that the chapter/club wishes to accomplish during the school year. The National FFA Organization (1995b, p. 48) defined it simply as "a road map to guide your chapter to its goals each year."

A POA provides many benefits to agricultural education students and programs. For example, Dormody and Seevers (1994, p. 42) stated "participation in planning, implementing, and evaluating leadership development activities enables FFA members to do the real work of their chapters and prepare for later life." When FFA members participate in planning, implementing, and evaluating the POA, they are participating in program planning: a process they will use often in future organizational work. According to Newcomb, McCracken, and Warmbrod (1993, p. 32) "students are motivated through their involvement in setting goals and planning learning activities." Students also "learn to solve problems, think critically, and learn from their successes and failures" (Dormody & Seevers, p. 47). Furthermore, higher-order thinking skills like synthesis and evaluation (Miller, 1990) are emphasized in planning, implementing, and evaluating the POA.

Smith and Edmunds (1995, p. 1) highlighted "the VSO program of work can be coordinated with classroom and occupational experiences and teaches leadership and the techniques of working with others toward common goals." Other benefits of POAs for FFA chapters (Kansas State Department of Education, 1977, p. 517) are:

1. They include goals that serve as a means of directing chapter activities in a positive manner.
2. They provide school administration and community with a better understanding of the local chapter.
3. They provide opportunity for members to use and develop skills taught in vocational agriculture.
4. They point out the vital part FFA has in a vocational agriculture department.
5. They are necessary for proper chapter recognition on the local, state, and national level.
6. They represent the combined thinking of a majority of the members and involve each member.

With so many apparent benefits to vocational-technical education and agricultural education students and programs for adopting the POA, it would seem likely that a high percentage of FFA chapters would be using one. In their study of FFA members in Arizona, Colorado, and New Mexico, Dormody and Seevers (1994) found that only 23 percent of respondents (n=51) had participated in POA planning and only four respondents indicated that POA planning was one of their top three leadership development activities while in FFA. They recommended that further research be conducted to determine advisor perceptions of the level of POA adoption in FFA chapters and FFA member participation in planning, implementing, and evaluating leadership activities. A review of the literature uncovered no other references to previous research bearing on these questions. Therefore, the researchers in this study decided to follow-up on this recommendation.

Purpose and Objectives

The purpose of this study was to describe New Mexico FFA advisors' educational exposure to, use of, and attitudes toward the program of activities (POA). Specific objectives were:

1. To describe FFA advisors by number of years of teaching, number of years advising a FFA chapter, age, and gender.
2. To describe FFA advisors' educational exposure to a POA through membership in a VSO as a youth, and the single greatest influence on them in developing the POA.
3. To describe whether or not FFA advisors have a POA; advisors' sources of knowledge used for developing a POA; POA committees adopted; method of convening committees; and student involvement in planning, implementing, and evaluating FFA activities through the committee structure.
4. To determine FFA advisors' attitudes toward the use of a POA.

Methods/Procedures

The population for this descriptive survey study was defined as secondary agricultural education teachers grades 9-12 in New Mexico who had FFA advising responsibilities during the 1995-96 academic school year (N=70). The frame of teachers was acquired from the state directory for agricultural education. Because the number of teachers was considered to be small, all were included.

An instrument was developed by the researchers to gather the data. The instrument contained three sections. Section one was designed to gather data from subjects pertaining to their attitude toward the use of a POA in their FFA chapter (objective 4) using a 7-point semantic differential scale. The scale was developed using three of Rogers' (1995) attributes of innovations (relative advantage, complexity, and compatibility) as a conceptual base. It contained 13 bipolar adjective pairs arranged in random fashion. For example, bipolar adjectives related to relative advantage were Important/Unimportant and Desirable/Undesirable. To reduce ambiguity of the term "program of activities", a definition was provided. Additionally, directions for filling out the scale with an example were provided.

Section two of the instrument was designed to gather situational information related to the use of a POA (objectives 2 & 3). Questions sought to gather data on whether subjects' FFA chapter had a POA; POA committees adopted (National FFA Organization, 1984); method for convening committee meetings; single greatest influence on them for developing a POA; student involvement in planning, implementing, and evaluating POA use; and advisors' sources of knowledge in developing a POA. Section three gathered demographic information from subjects (objective 1).

The instrument was submitted to a panel of experts consisting of five persons to determine face and content validity. The panel included three faculty and two graduate students in the Department of Agricultural and Extension Education at New Mexico State University knowledgeable in instrumentation. Suggestions and comments offered by the panel were incorporated into the final version of the instrument.

To determine the reliability of the instrument, a pilot test was conducted. The pilot test group consisted of 15 purposefully selected vocational-technical teachers in New Mexico who attended the 1995 state Vocational-Technical and Adult Education Conference. Because of the nature of the questions, subjects were given two administrations of the same instrument to calculate a test-retest reliability estimate on non-demographic items. An average of 92.5 percent test-retest agreement was attained with individual items ranging from 80.5 to 100. Using data from the first administration, a Cronbach's alpha was calculated for establishing the reliability on the semantic differential scale. The resultant reliability estimate was a Cronbach's alpha of .79.

Data were collected in Spring 1996. Subjects were sent a package containing a cover letter, questionnaire, and a postage paid, self-addressed envelope. The cover letter was structured according to Dillman (1978). The questionnaire was presented in booklet form and contained a code number for tracking purposes.

After follow-up efforts of a reminder postcard, a second package, and a second reminder postcard, a response rate of 67 percent (n=48) was achieved. However, one returned questionnaire was not usable and eliminated from the study. To address non-response error, a sample of the non-respondents was compared to the sample of respondents (Miller & Smith, 1983). Twenty percent (n=5) of the non-respondents (n=22) were randomly selected to represent the non-respondent group. Subjects representing the non-response group were contacted by telephone to record their responses. Using independent t-test analyses, non-respondents were statistically compared to respondents on three variables (attitude toward the use of a POA, age, and number of years of teaching) at a .05 significance level.

No significant ($p>.05$) differences were found to exist between the sample of non-respondents and the sample of respondents on the three variables. Thus, the non-respondent data (n=5) were pooled with the usable respondent data (n=47) yielding a sample size of 52 (74%) allowing generalizing to the population (Miller & Smith, 1983). Descriptive parameters were used to analyze the data.

Results

Agriculture teachers had an average of 12 years teaching experience with equal number of years serving as an FFA advisor (Table 1). The mean age of the teachers was approximately 38 years ranging from 23 to 54 years with the majority (92.3%; n=48) of the teachers being male and approximately 8 percent (n=4) being female.

Table 1. FFA Advisors' Characteristics (n=52)

Characteristic	Mean	Std. Dev.	Range	Frequency	Percent
Teaching Experience	11.8	8.43	1 -30		
FFA Advisor	11.5	8.34	1-30		
Age	38.1	9.09	23-54		
Gender					
Female				4	7.7
Male				48	92.3
Total				52	100.0

When FFA advisors were asked if they had been exposed to developing a POA as a former VSO member, 50 percent (n=26) indicated YES (Figure 1). While the remaining 50 percent of the FFA advisors indicated either NO (34.6%; n=18) or that they were never a VSO member (15.4%; n=8).

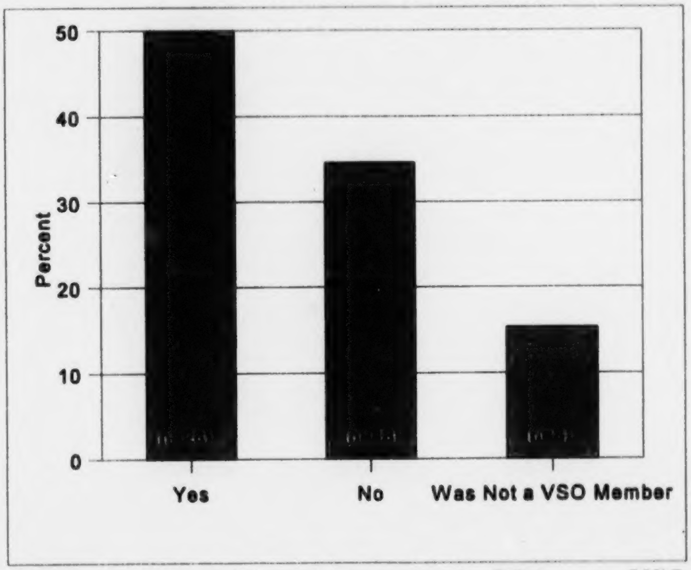

Figure 1. FFA Advisors' Exposure to POA as a VSO Member

FFA advisors were questioned whether or not their FFA chapter had a POA. Of the 52 FFA advisors, approximately 80 percent (n=43) indicated that their FFA chapter had a POA. Furthermore, of the FFA advisors who indicated their FFA chapter had a POA, approximately 26 percent (n=11) indicated that state mandate was the single greatest influence on them for having one (Figure 2). Students (23.3%; n=10), an existing POA (18.6%; n=8), a competitive event (7.0%; n=3), personal interest (4.7%; n=2), and other (2.3%; n=1) factors were identified as having the single greatest influence on advisors in developing a POA. Eight (18.6%) FFA advisors identified more than one single greatest influence for developing a POA.

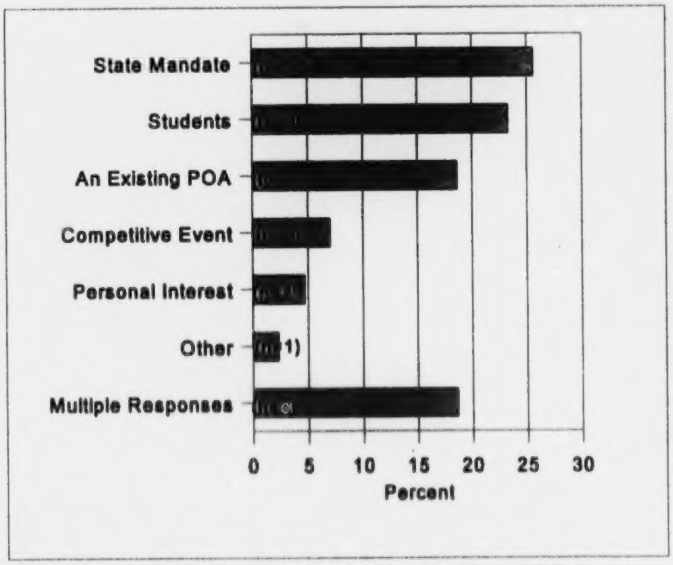

Figure 2. Influential Factors in Developing a POA

Similarly, when polled as to the source(s) of knowledge for developing a POA, FFA advisors whose FFA chapter had a POA indicated other agriculture teachers (42.3%; n=22) as the most frequently cited source of knowledge (Figure 3). Pre-service education (21.2%; n=11), written material (19.2%; n=10), prior experience as a VSO member (17.3%; n=9), and in-service education (9.6%; n=5), respectively, were also frequently cited as sources of knowledge (advisors could identify more than one). Examples of sources identified in the "other" category were the state supervisor, self-taught, and examples of a POA.

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FFA advisors who indicated having a POA for their FFA chapter were asked to indicate standing committees contained in the FFA chapter POA. The most frequently cited standing committees were leadership (93%; n=40) and community service (93%; n=40) (Figure 4). In contrast, the standing committee cited least, aside from "other", was the banquet committee (58.1%; n=25). Other standing committees frequently cited, arranged in descending order, were public relations (88.4%; n=38), recreation (88.4%; n=38), scholarship (88.4%; n=38), earnings and savings (88.4%; n=38), supervised agricultural experience (86.0%; n=37), conduct of meeting (83.7%; n=36) state and national activities (81.4%; n=35), cooperation (79.1%; n=34), and alumni relations (67.4%; n=29) (Figure 4). For FFA advisors who reported having a POA, the most frequently reported time for convening POA standing committee meetings was during class (53.5%; n=23) (Figure 5). Other times (arranged in descending order by frequency) for convening POA standing committee meetings were during lunch (27.9%; n=12), during chapter meetings (27.9%; n=12), after school (20.9%; n=9), and prior to chapter meetings (18.6%; n=8). In addition, approximately 14 percent (n=6) of the FFA advisors identified other times for convening POA standing committee meetings.

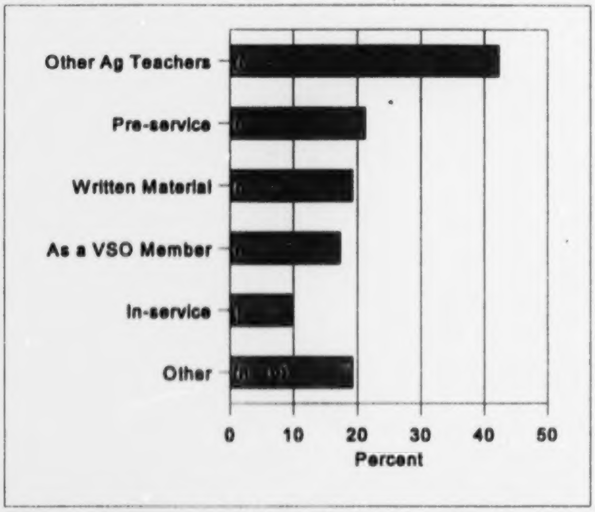

Figure 3. Sources of Knowledge for Developing a POA

FFA advisors were asked to indicate whether or not FFA members participate in planning, implementing, and evaluating the POA activities. One hundred percent (n=42) of the FFA advisors with a POA indicated that their FFA members participate in the planning and implementation of the POA activities. However, approximately 67 percent (n=28) indicated their FFA members participate in evaluating POA activities.

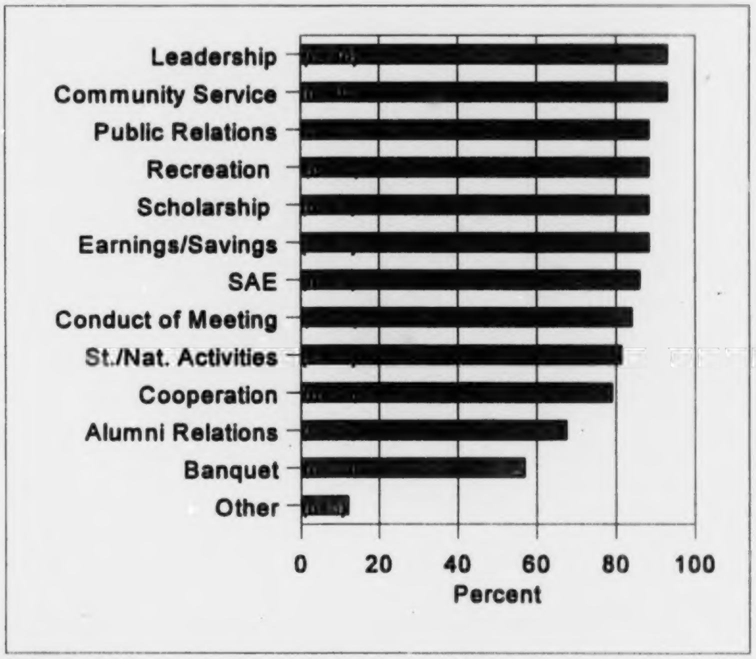

Figure 4. Use of POA Standing Committees

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When determining FFA advisors' attitude toward the use of a POA, a 7-point semantic differential scale was used. The bipolar scale contained 13 adjectives and the responses summated to yield an average score. On scale from 1=unfavorable to 7=most favorable, FFA advisors had a mean attitude score of 4.6 with a standard deviation of .90 (Table 2). Individual mean scores ranged from 2.6 to 6.4.

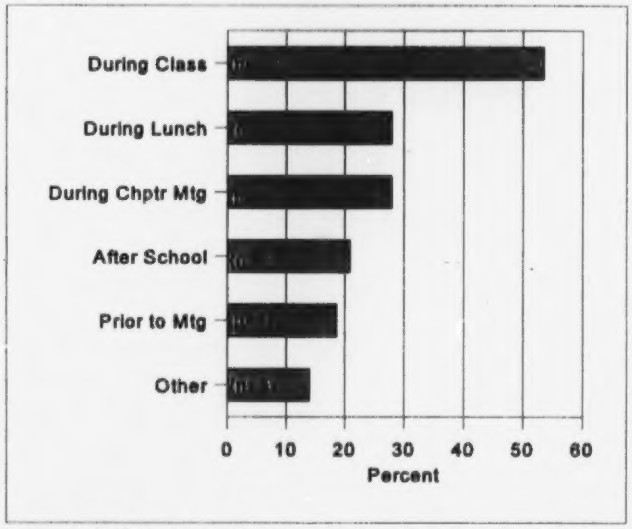

Figure 5. Methods for Convening POA Committees

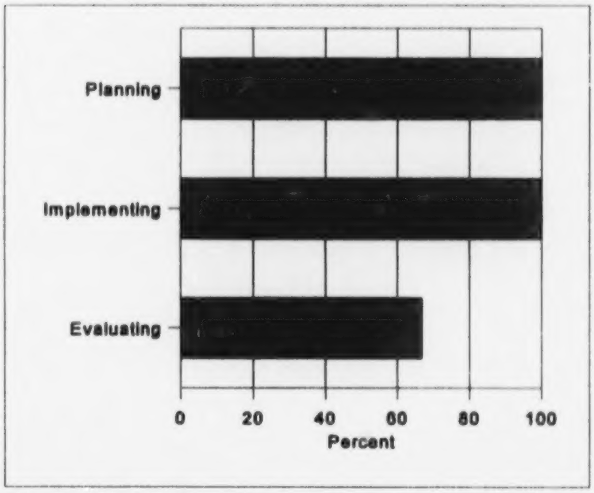

Figure 6. Student Participation in Developing a POA

Table 2 FFA Advisors' Attitude Toward the Use of a POA (n=52)

Construct	Mean	Std Dev.	Range
Attitude	4.60	.90	2.62-6.38

Note. Scale based on: 1=unfavorable to 7=most favorable

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Conclusions and Recommendations

Based on the data, it was concluded that FFA advisors in New Mexico can be represented has having approximately 12 years of teaching and advising experience. The average age for the predominate male group was 38 years of age. In addition, the majority of the FFA advisors had been former VSO members during their secondary education.

The majority of FFA chapters had a POA. Of the 11 potential single greatest influence factors for developing a POA that were available for FFA advisors to identify, only five factors were solely identified. The five factors were state mandate, students, an existing POA, competitive event, and personal interest. Factors that were not identified as influential for developing a POA were peers/colleagues, student-teaching experience, pre-service course work, commercial POA packages, and availability of a word processor. Consequently, it is recommended that persons interested in promoting the use of a POA for FFA chapter operations consider requiring FFA advisors to develop and submit a copy of their POA to the state office for agricultural education to meet a state mandate, communicate its value to advisors from the students' perspective, and provide teachers with sample model POAs from their state.

It was also concluded that other agriculture teachers were the most frequently cited source of knowledge in developing a POA. Pre-service, written materials, and experience as a former VSO member were also frequently cited sources of knowledge for developing a POA. Based on these conclusions, it is recommended that persons interested in promoting the use of a POA facilitate the networking of teachers and promote the use of other teachers as an important source of knowledge and experience for developing a POA. Furthermore, effort should be made to strengthen pre-service and include in-service course work in developing a POA. It is particularly important to make these changes now, because the National FFA Organization (1995a) has adopted new guidelines for developing a POAs. Written materials should be made available through the teacher education unit and state office for agriculture education.

FFA advisors adopted the standing committees outlined by the National FFA Organization (1984). The most frequently cited standing committees were leadership and community service, whereas, the least frequently cited standing committee was banquet. FFA advisors should be encouraged to adopt a committee structure that is compatible with members' interests and needs, chapter and community needs, and the size of the chapter.

The most frequently identified time for convening committee meetings was during class. This conclusion might suggest that convenience in scheduling is important in arranging for committee meetings. Meeting during class time allow for optimal member participation. Thus, it is recommended that FFA advisors utilize time during class to convene committee meetings in addressing activities related to the chapter POA. This requires structuring committees by class. In doing so, advisors should consider maturity and experience of members when assigning committees to classes. Other recommended times for convening POA committee meetings include during lunch and during chapter meetings.

FFA advisors reported that all their members are involved in planning and implementing FFA activities related to POA committees. These percentages for member participation in the POA are much higher that those reported by members (Dormody & Seevers, 1994) indicating that members may not be aware of when they are working on the POA. Advisors need to ensure that members understand their role and responsibilities for the POA. Similarly, members need to spend time on the POA throughout the school year. Committee meetings for POA update should be held regularly to ensure success.

Only 67 percent were involved in the evaluation of activities related to POA committees. This would suggest that some members are either not given an opportunity to evaluate committee activities or they are not taking advantage of the opportunity. It is therefore recommended that pre-service and in-service education, and state agricultural education leaders communicate the importance of involving members in evaluating POA committee activities. Through these experiences members can engage in the complete program planning process, capitalize on successes and failures, and utilize higher-order thinking skills for improving the benefits to members, chapter, and community gained through a POA.

Regarding FFA advisors' attitudes toward the use of a POA, it was concluded that they have a moderately (mean=4.6) favorable attitude. Based on a 7-point scale, where 7 is favorable, there remains a margin for growth in FFA advisors' attitudes. Thus, attitudes should be strengthened through in-service and pre-service education. Using these modes of delivery, presenters should attempt to reduce the perceived complexity and increase the relative advantage and compatibility for using a POA to guide FFA activities.

A recommendation for further research is to obtain actual written POAs from FFA advisors and analyze them for comprehensiveness, member participation, and committee structure, among other elements.

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A Profile of the Program of Activities Used by FFA Chapter Advisors

A Critique

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Future teachers and advisors are taught how to use the various management tools and materials of the FFA, i.e. how to use manuals, how to fill out award applications, how to prepare a Career Development team, etc. I commend the authors for selecting a FFA tool and determining just how useful it is and if it is being used as intended.

The purpose and objectives of the study were clearly written. Appropriate research methods and procedures were followed in conducting the study. My only procedural question pertained to the pilot test group. Were the 15 vocational teachers from areas other than agriculture and if so, were they familiar with the use of a POA?

An interesting result was that state mandate was the single greatest influence on advisors having a POA followed by student influence. Do teachers really value POAs and can they theoretically justify the POA's use to their students? It appears that some training for using POAs did occur in the pre-service education. What is the best delivery mechanism for helping FFA advisor learn how to use this tool?

The conclusions primarily restate the findings. What can we conclude? Perhaps one conclusion is that mandates will result in teachers implementing FFA management tools. Are there other ways to manage a chapter's program that would be more useful than the POA model? The authors suggest that pre-service education and networking be utilized more for POA training. What kind of training or activities would help convince future teachers of the importance of the POA? An analysis of exemplary POAs seems like a good recommendation.

I encourage the authors to continue to exam the tools that our profession develops to teach young people leadership and organizational management. Hopefully, we will involve our pre-service students and practicing teachers in developing useful materials.

Students' Perceptions Of Block Scheduling In Agricultural Education

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The National Commission on Time and Learning, in their 1994 report Prisoners of Time, assert that (p. 1) "Learning in America is a prisoner of time." The Commission found that the structure of the school day has remained constant for decades. According to the Commission, the way time is organized in schools may have contributed to the educational deficiencies in American education identified in such reports as A Nation at Risk (National Commission on Excellence in Education, 1983). Sizer (1992) and the Coalition of Essential Schools along with educators such as Carroll (1990) argue that changing the schedule is crucial for making schools successful.

Starting in the late 1980s, a new approach to organizing the school day emerged. This new approach is commonly referred to as block scheduling. In one approach to block scheduling (4 x 4), students complete four courses in one semester. Each course meets for approximately 90 minutes each day. During the second semester students complete four additional courses. A second type of block scheduling (AB), has the student taking eight courses at once. The student attends four of the courses on one day (A) and the other four on the next day (B). Each class meets for about 90 minutes throughout the school year.

The block approach to organizing the school day is growing in popularity. According to the National Study of High School Restructuring (Cawelti, 1994), block scheduling is being used in some fashion by one in ten high schools. Sommerfield (1996) reports that 14 percent of high schools are on block scheduling. Block scheduling is rapidly gaining popularity in Wisconsin, Virginia, Colorado, Florida, Pennsylvania, West Virginia, Illinois, Kentucky, Indiana, and Minnesota. Substantially more than 10-14 percent of schools use block scheduling in some states. In Indiana, approximately 25 percent of the schools use block scheduling (Greenfield-Central High School, 1996). In North Carolina, the number of high schools on block scheduling has grown from 9 percent in 1993-94 to 62 percent in 1995-96 (North Carolina Department of Public Instruction, 1996).

Is block scheduling truly an educational innovation or is it just one more of a long list of educational fads? While there are some nay sayers with respect to block scheduling, the majority of the limited but growing body of literature is positive in regards to block scheduling. Typically, the people opposed to block scheduling are parents who associate block scheduling with outcomes based education. Lindsay (1997) claims there is no empirical evidence to support block scheduling. Sabia (1997) maintains a Web site titled "Block Scheduling House of Problems" where anti-block scheduling information is posted.

The growing body of literature (Bethel, 1996; Perreault and Isaccson, 1996; Schoenstein, 1996; Sharber, 1997; Sommerfeld, 1996, Wisconsin, 1996) which supports block scheduling reports that under block scheduling student attendance improves, honor roll numbers increase, failures decline, low achieving students achieve more, and behavior improves. Student achievement is about the same if not slightly better under block scheduling (North

Carolina Department of Public Instruction, 1996). Other benefits of block scheduling include (Vauter, 1996; Carroll, 1990): the potential of reducing the number of classes students must attend and prepare for each day, providing flexible time for students who need more time to learn material, reducing the number of courses that a teacher must prepare for each day, giving teachers enough time to plan for both instruction and learning, providing opportunities for students to take more courses, and building stronger relationships between teachers and students. Generally, teachers and students like block scheduling.

Since block scheduling is relatively new, there is not a truly comprehensive body of quality research on this educational approach. Furthermore, research on the impact of block scheduling in the operation of agricultural education programs is scant. Moore, Becton, and Kirby (1996) found that agricultural teachers in North Carolina tend to support block scheduling but believe it has negatively impacted the FFA. While it is important to know what agriculture teachers think about block scheduling since they are the ones implementing the concept, it is equally important to determine how students react to block scheduling. After all, students are the customers of the educational process. The purpose of this research effort was to determine how agricultural education students view block scheduling.

The theoretical foundation for this research is derived from the Concerns Based Adoption Model (CBAM) developed by Hall and his associates (Hall and Loucks, 1978; Hall and Hord, 1987). The CBAM was designed to provide an understanding of the target audience's perceptions of change. By understanding how people act to change, adjustments can be made to the innovation. The CBAM is based on six main assumptions about change:

1. Change is a process, not an event.
2. Change is accomplished by individuals.
3. Change is a highly personal event.
4. Change involves developmental growth.
5. Change is best understood in operational terms.
6. The focus of change facilitation should be on individuals, innovations and the context.

The third assumption, change is a highly personal event, is an extremely personal experience, and how it perceived by the individuals will strongly influence the outcome. Since many agricultural education programs are involved in the move to block scheduling, it is imperative that student perceptions be measured so adjustments can be made (if needed) in order to insure that students receive a high quality education.

Purpose/Objectives

The primary purpose of the study was to measure the attitudes and perceptions of agricultural education students toward block scheduling. Specific research questions were:

1. Do agricultural education students like block scheduling?

2. What are the perceptions of agricultural education students regarding the impact of block scheduling on the:
    A. Instructional program
    B. FFA
    C. Supervised Agriculture Experience (SAE)

3. Is there a relationship between students' GPAs and their attitudes toward block scheduling?

4. Do FFA officers' perceptions of the impact of block scheduling on the FFA differ from non-officers?

Methods/Procedures

This study used a descriptive research design. Survey methodology was employed to collect data. The survey technique is often used in the agricultural and extension education field. This approach is an acceptable way to gather data from a fairly large population (Borg & Gall, 1989).

Population and Sample. A purposive sample/population was used in this study. The researchers wanted to survey high school students who had experienced both a traditional school schedule and a block schedule.

Therefore the decision was made to survey junior students who were attending high schools that were starting their second year of block scheduling in the fall of 1996. This means students were on a traditional schedule as freshman and a block schedule as sophomores. Twenty-two schools were identified during the annual teachers conference as entering their second year of block scheduling. The junior agricultural education students in these schools comprised the population for this study. The entire population of schools were used in the study.

Instrumentation. The instrument used was a modification of an instrument used by Becton (1996). The Becton instrument was thoroughly field tested and had an established reliability of .92. The Becton instrument was used to measure the attitudes and perceptions of agricultural teachers toward block scheduling. Minor changes were made in the wording of statements to reflect the students perspective. For example, one of the original statements in the Becton instrument was, "My students are learning more since we implemented block scheduling." This item was reworded to read "I am learning more since we implemented block scheduling." Approximately half of the original statements needed slight adjustments in wording.

The core of the instrument contains 28 Likert-type items with a 1-5 response scale, five (5) being the most favorable. Nine items were worded negatively and were reverse scored. The 28 items were grouped into four sub-scales: Classroom Instruction, FFA, SAE, and Attitude. Students were also asked to provide demographic data. There were four open-ended questions which allowed the students to make statements about block scheduling. The open ended questions were used as ancillary data in further interpreting student responses to selected statements.

Data Collection. Packets of instruments were mailed to the agricultural education teachers in the 22 high schools in the population. The teachers administered the survey to the students. The packet of surveys mailed included: a cover letter, an instruction sheet to administer the questionnaire, questionnaires, and a self addressed stamped return envelopes. The first questionnaires mailed were light blue in color. Actual stamps were placed on the return envelopes to help ensure a higher return rate (Dillman, 1978).

After the first packet of questionnaires were sent out, phone calls were made to the agriculture teachers to verify that packets had arrived and to remind them of the study. Two weeks after the phone calls, a second packet was mailed to the non-responding schools. The second packets were green in color to differentiate between the mailings. Data were collected from 18 of the schools, which resulted in an 82 percent response rate (260 students). According to Isaac and Michael (1984), non-response is not a threat to the validity of a study when response rates are greater than 80 percent.

Data Analysis. The data were analyzed using Microsoft Excel 5.0. Basic descriptive statistical procedures were used in developing frequency tables. Since this was a census study, actual differences between groups were examined using population mean scores. A Pearson product moment correlation was used to examine the relationship between GPA and students' opinions of block scheduling.

Results/Findings

Research Question 1- Do agricultural education students like block scheduling?

The students are more positive than negative about block scheduling. The mean attitude score for the six attitude items was 3.31 on a five point scale (See Table 1, note: the items are extracted from the instrument and grouped for reporting purposes but were randomly ordered on the survey instrument). This score falls between the undecided/no opinion and agree on the response scale.

Table 1

Attitudes of Students Toward Block Scheduling

STATEMENTS	Mean	SD
1. I personally like block scheduling.	3.17	1.23
2 * I would prefer to return to a more traditional schedule.	3.05	0.86
3. Most of my peers like block scheduling.	3.14	0.91
4. I can focus better under block scheduling because I have fewer courses.	3.46	1.12
5. I believe block scheduling is a better way to organize school time.	3.46	1.08
6. Block scheduling has been successful in my school.	3.60	1.05
Mean Attitude Score	3.31	

[1]The rating scale was: 1 strongly disagree, 2 disagree, 3 undecided or no opinion, 4 agree, 5 strongly agree
*These items were reverse coded.

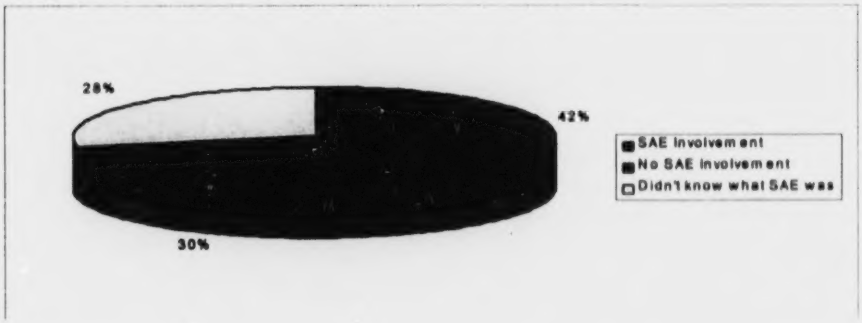
Research Question 2 - What are the perceptions of agricultural education students regarding the impact of block scheduling on:

A. Instructional program
B. FFA
C. SAE

Overall, students do not believe block scheduling is having a negative impact on the components of the agricultural education program nor do they believe block scheduling is having a major positive impact on the program. Mean scores were calculated for statements related to SAE, FFA, and instruction program. The mean score for statements related to the FFA was 3.21, SAE 3.12, and instruction 3.36. All of the scores fall between undecided and agree on the rating scale. These data are presented in Table 2 (the statements have been grouped for display purposes, they were randomly order on the instrument). The three statements with the highest amount of agreement were: "It is easier for me to learn how to keep SAE records with the longer class periods" (M=3.83), "My agriculture teacher has changed his or her ways of teaching since we have gone to block scheduling" (M=3.75) and "More content is covered in my class under block scheduling" (M=3.65).

The response to a couple of statements were disturbing; especially in light of selected student demographic data. One disturbing response was; "My advisor has visited my SAE program less since we have been on block scheduling" (M=2.62). This item was reverse coded so a high score was more desirable. The mean of 2.62 indicates that advisors are indeed visiting SAE programs less. A companion statement, "Block scheduling has allowed me to have a different type of SAE" (M=2.43), indicates teachers may not be utilizing some of the newer types of SAE programs. When responses to these statements are viewed in light of responses to the demographic information supplied by students about their SAE program, the results get worse. One hundred and four (104) students had a SAE program, 75 reported they did not have a program, and 71 students indicated that did not know what a SAE was; and these are juniors! More than half of the students did not have a SAE program. These data are graphical portrayed in Figure 1. Because some students do not have a SAE program, the SAE responses were low.

Figure 1 Student Involvement with SAE



Research Question 3 - Is there a relationship between students' GPAs and their attitude toward block scheduling?

The mean GPA of the respondents was 2.72. When the GPA was correlated with the mean attitude score (Table 1), the correlation was .23 which is statistically significant at p=.05, though it is considered to be a weak correlation. This indicates students with higher academic ability tend to be more positive about block scheduling.

Research Question 4 - Do FFA officers' perceptions of the impact of block scheduling on the FFA differ from non-officers?

In earlier research it was found that agricultural teachers perceived that block scheduling was having a negative impact on the operation of the FFA. Do FFA officers share the same view? Out of 186 FFA members in this study, 26 served as officers and 160 did not. In examining the sub-scores there was a difference in the FFA category. The mean score for FFA officers on the FFA statements was 2.82, which was considered to be neutral learning toward the disagree side. The mean score for the FFA items was 3.28 for the non-officer, which was considered to be neutral leaning toward the positive side. The difference in mean scores or nearly half a point on a five point scale indicate there is a difference between the two groups. FFA officers view block scheduling as it relates to the operation of the FFA less favorably than do the rank-and-file member.

Conclusions/Recommendations/Implications

Students are inclined to be more positive than negative over block scheduling. Students like (a) extra time to complete assignments, (b) new teaching methods employed by teachers, (c) the fact that block scheduling makes it easier to enroll in agricultural. The majority of students said that they personally liked block scheduling and that it had been successful in their schools.

When examining students perceptions of block scheduling in the sub-categories of FFA, SAE, and instruction programs, the overall impact was considered to be more positive than negative. Of the three agricultural education components, students believed that block scheduling was more beneficial to the classroom instruction component of agricultural education than FFA or SAE. The findings reveal that SAE is a weak component of the agricultural education program.

GPA comparisons imply that students who excel academically tend to have a more favorable opinion of block scheduling. This finding is interesting because some of the perceived concerns from those opposing block scheduling (Lindsey, 1997; Sabia, 1997) are that students of higher academic ability suffer under block scheduling. Research (North Carolina Department of Public Instruction, 1996) does indicate that poorer performing schools (on standard measures of academic achievement) are more likely to be on block scheduling.

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Table 2.

Students Perceptions of the Impact of Block Scheduling on FFA, SAE, and Instruction

CATEGORIES/STATEMENTS	Mean[1]	SD
FFA		
1.* Our FFA program seems more difficult to operate since we are on block scheduling.	3.42	1.01
2. It is easier to develop a FFA Program of Activities under block scheduling.	3.12	1.02
3.* Block scheduling makes it more difficult for our chapter to prepare FFA contest teams.	2.94	0.81
4. Attendance for FFA chapter meetings has increased since block scheduling.	3.39	1.12
5. As a result of block scheduling our FFA program has improved.	3.18	1.00
Mean FFA Score	3.21	
SAE		
6.* It is more difficult for me to have a SAE (Supervised Agriculture Experience) program with block scheduling.	3.36	0.87
7. It is easier for me to learn how to keep SAE records with the longer class periods.	3.83	1.09
8. More of my peers are showing interest in the SAE program under block scheduling.	3.37	0.98
9.* My advisor has visited my SAE program less since we have been on block scheduling.	2.62	1.23
10. Block scheduling has allowed me to have a different type of SAE.	2.43	1.09
Mean SAE Score	3.12	
CLASSROOM INSTRUCTION		
11. I have more time to complete assignments under block scheduling	3.40	0.92
12. The quality of students in the program has improved since we implemented block scheduling.	2.98	1.04
13.* There seems to be more discipline problems in the classroom after block scheduling was implemented.	3.45	1.09
14. My grades have improved as a result of block scheduling.	3.14	0.86
15. Our agriculture labs are utilized more effectively under block scheduling.	3.07	0.80
16. Block scheduling makes it easier to enroll in agriculture education courses.	3.53	0.86
17. More content is covered in my class under block scheduling.	3.65	0.97
18.* It is hard for me to stay interested in class with the long class periods.	3.41	1.10
19. My agriculture Teacher has changed his or her ways of teaching since we have gone to block scheduling.	3.73	1.17
20. I seem to be learning more since we went to block scheduling.	3.40	1.27
21.* I seem to be learning less since we went to block scheduling.	3.03	0.98
22.* I have more trouble sitting through the longer periods of block scheduling.	3.31	1.17
Mean Instruction Score	3.36	

[1] The rating scale was: 1 strongly disagree, 2 disagree, 3 undecided or no opinion, 4 agree, 5 strongly agree
*These items were reverse coded.

FFA officers do not believe block scheduling helps in the operation of the FFA. Agriculture teachers share some of the same concerns (Moore, Becton, Kirby, 1996).

It appears that the opinions of the students toward block scheduling are consistent within the schools. In analyzing the data, the researchers found that students from the same school were inclined to have either a positive or a negative opinion of block scheduling. It may suggest that students' perceptions of block scheduling may be a consequence of the implementation of block scheduling by teachers and administration. This is an issue in alternative scheduling that needs to be addressed further.

Implications of this research suggest a need to:

1. Develop strategies for more effectively operating FFA programs under block scheduling. Teachers are making adjustments in the way they teach but similar adjustments are not being made in the FFA. In previous research, Moore, Becton and Kirby (1996) suggested teachers might want to consider having fall and spring FFA officers, establish a FFA communications system, and restructure the state career development events to have both fall and spring events. At the state level, the career development event restructuring has been implemented. It is now up to the teachers and FFA officers to make changes at the local level.
2. Improve the SAE component of agricultural education. Schools on block scheduling are inadequate in implementing the SAE program. Summer in-service education activities should be developed to educate teachers about the newer types of SAE programs and how they can be used with block scheduling. The more traditional types of SAE activities may need to be re-examined to see how they can be incorporated or modified to work in block scheduling situations.
3. Utilize a variety of teaching techniques and short breaks to assist students in adapting to the long 90-minute class periods. While student responses to statements related to teaching methods were positive, there is still room for improvement. On the open ended questions, 54 percent of the students who responded to the questions (N=157) indicated that teachers were doing more hands-on activities and utilizing different teaching methods but 48 percent of the respondents indicated the classes were too long and it was hard to pay attention at times. Teachers are doing a good job in adopting their teaching to block scheduling but need to continue to look for ways to improve.
4. Adjust the block scheduling program to help each student excel. Research needs to be conducted to explore reasons why students who achieve at a lower level have a less positive view of block scheduling.
5. Determine if there is a relationship between teachers' attitudes towards block scheduling and the students' perception of block scheduling. While this research did not address this question, after analyzing the data the researchers believe there may be a relationship between the attitudes of the teacher and his/her student regarding block scheduling.

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Student Perceptions of Block Scheduling in Agricultural Education

A Critique

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Block scheduling or some form of it continues to grow throughout the educational arena. How the structure of schooling impacts young people is a very important question. The authors are contributing to a Block Scheduling body of knowledge. This study evolved from a previous study focused on teachers' attitudes. The authors are to be commended for focusing on a practical problem that faces the state. The extent of agreement among teachers and students and perhaps even administrators does have appeal for future research.

The study is grounded in a thorough review of the literature. The Concerns Based Adoption Model (CBAM) is appropriate to stimulate our thinking about change. The instrumentation used does not really test change theory or seek a level of concern. Is there a theoretical basis for schools moving to block scheduling, i.e. time on task increases achievement, a theory of length of period influences depth of content and retention, or a theory that the authors propose?

The researchers conducted the study in an appropriate manner. Achieving an 82% response rate is commendable. The purpose and objectives are clearly stated. The findings address the questions and logical conclusions and recommendations are drawn. In terms of findings, students appear to be neutral about block scheduling. Obviously paper length is always limiting, but I would be interested in reading some the comments of students who were really sold or really irritated about block scheduling. It seems that block scheduling is making an impact when students agree that the time benefits them in SAE record keeping, that they recognize an obvious change in the way the teacher is teaching - hopefully to the good, and they acknowledge that more content is being covered. Should teacher be covering more content or does it only seem that way?

Students recognize the challenges of managing FFA on a block schedule and imply that the SAE program is worse now than before block scheduling. Are teachers spending so much time preparing for block classes that they are sacrificing the leadership and SAE components?

The authors are insightful to observe the parallel of student and teacher opinions from the same school. Perhaps through pilot projects teachers and their students could test the most effective FFA and SAE management strategies. I commend the authors on an excellent study and recommend that they follow-up on their recommendations for future research.

Youth Leadership Development: How Much Do We Know?

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Introduction

The development of agricultural leadership skills has been one of the primary aims of the National FFA Organization since its inception in 1928. Among the primary purposes of this agricultural youth organization is the development of skills in communications, human relations, social abilities, citizenship, cooperation, and resource management (Official FFA Manual, 1993). As an intracurricular tool, the National FFA has had a successful and lasting impact for most youth in an agricultural education program.

William Brock, Chairman of the Labor Secretary's Commission on Achieving Necessary Skills (SCANS, 1992), passionately wrote about the urgency for all educational programs to address the needs (other than academic) of students and society. Brock (1992) wrote, "there is much more to life than earning a living, and we want more from education than productive workers. We want citizens who can discharge the responsibilities that go with living in a democratic society and with becoming parents" (p. 4). In essence, the SCANS Report was addressing the need for leadership training and the development of life skills needed by responsible, trustworthy adults.

The 1992 SCANS Report identified workplace competencies needed by all workers, such as the ability to manage resources, work productively with others, acquire and use information, understand complex systems, and work comfortably with a variety of technologies (Brock, 1992). Competent workers will be characterized by their basic skills (reading, writing, speaking, listening), thinking skills (ability to learn, creative thinking, decision making, problem solving) and personal qualities (responsibility, self-esteem, self-management, sociability, integrity) (Brock, 1992).

Theoretical Framework

There are many striking similarities between the SCANS Report and the primary purposes of the National FFA Organization. Those similarities could be described as the development of leadership and life skills. With this framework in mind, one may question, does participation in FFA leadership activities provide agricultural education students with life skills and personal qualities as defined by the 1992 SCANS Report? Is participation in FFA leadership activities solely responsible for youth leadership and life skills development, or are other factors contributing to the development of these skills?

Several investigators have explored the phenomenon, "leadership development and life skills gained," through participation in the FFA. Among earlier studies is one completed by Townsend and Carter (1983). They found the total FFA activity participation score had a positive correlation with the leadership trait for 12th-grade agricultural education students in Iowa. Ricketts and Newcomb (1984) gathered data from 12th

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grade senior males in middle Tennessee. Their study revealed "vocational agriculture students/FFA members from both superior and non-superior chapters possessed significantly more leadership and personal development abilities than nonvocational agriculture students" (p. 58).

McKinley, Birkenholz, and Stewart (1993) investigated participation in organizations and activities that was related to the perceived leadership abilities of students enrolled in the College of Agriculture at the University of Missouri-Columbia. They found "significant relationships between these four factors--interpersonal relations, administration, self management, and communications--and participation in athletics, National Honor Society, FFA, student council, language club, departmental clubs, social fraternity or sorority, intramurals, church groups, 4-H, and livestock association" (p. 81).

The most definitive study to date was conducted by Dormody and Seevers (1994). These researchers investigated variables that predicted youth leadership life skills development among FFA members in Arizona, Colorado, and New Mexico. Dormody and Seevers (1994) attempted to determine the predictors of youth leadership life skills development (YLLSD) from among participation in FFA leadership activities, achievement expectancy, self-esteem, years in the FFA, age, ethnicity, gender, and place of residence. The major findings of their study were: three variables--achievement expectancy, participation in FFA leadership activities, and gender--explained significant amounts of the variance in YLLSD scores; the three variables explained a total of 16.7% of the variance in YLLSD scores; and leadership life skills development was not related to self-esteem, years in the FFA, age, ethnicity, nor place of residence (Dormody and Seevers, 1994). Considering the review of literature, the author of this research determined that a distinction should be made between the concepts "youth leadership" and "life skills development." As such, the original terminology used by Dormody and Seevers (1994) was modified appropriately for this study.

The development of leadership and life skills through participation in FFA activities is not an outcome exclusively enjoyed by the National FFA Organization. Clark (1978) laid the groundwork for organization-specific research studies when he explored the benefits of club membership and leadership development within the Distributive Education Clubs of America (DECA). Among the major findings was that leadership ability of students increased with participation in the DECA chapter. Other researchers found similar results when examining comparable organizations, such as Future Homemakers of America, Office Education Association, and Vocational Industrial Clubs of America (White, 1982; Smith, 1984); and, Future Business Leaders of America (Spicer, 1982). Other researchers have concluded that positive associations exist between leadership development and cumulative grades (Pope, 1983) and extracurricular school activities (Holland and Andre, 1987).

No study was found which had investigated relationships between youth leadership and life skills development and participation in agricultural youth organizations, or other youth organizations. Likewise, no research was found where comparisons were made between youth leadership and life skills development and school- or community-based leadership activities, for agricultural students in grades nine to twelve.

Purpose and Objectives

The central problem of this investigation was to determine if a significant relationship existed between Iowa FFA members' self-perceived youth leadership and life skills development scores and their participation in youth leadership activities. The objectives for this study were:

1. To describe Iowa FFA members by their self-perceived youth leadership and life skills development scores, participation in FFA leadership activities, participation in nonFFA leadership activities, achievement expectancy, years in the FFA, age, gender, self-reported cumulative grades, and place of residence;
2. To determine if relationships exist between self-perceived leadership and life skills development and selected independent variables; and,
3. To determine if a significant difference existed in the YLLSDS grand mean scores from this study and the study by Dormody and Seevers (1994) in Arizona, Colorado and New Mexico.

Procedures

Descriptive survey methodology and a correlational design were used in this study. The dependent variable was youth leadership and life skills development. The independent variables were participation in FFA

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leadership activities, participation in nonFFA leadership activities, achievement expectancy, years in the FFA, age, gender, self-reported cumulative grades, and place of residence. Both the dependent and independent variables were ascertained after their natural occurrence. The instrument used was The Iowa FFA Youth Leadership Life Skills Development Questionnaire, developed by the researcher, contained individual sections for measuring the dependent and independent variables. A post hoc test was performed and Cronbach's Alpha coefficient of reliability was calculated for each section and the total instrument. Cronbach's alpha for the total instrument in this study, excluding demographics, was .93.

The YLLSD was developed to measure self-assessed scores of youth leadership skills gained through participation in 4-H and/or FFA activities. The Youth Leadership Life Skills Development Scale (YLLSDS) is a 30-indicator, unidimensional instrument (Seevers, Dormody & Clason, 1995). For the purposes of this study, selected Iowa FFA members indicated their perception of "gain" acquired through their experiences in the Iowa FFA Association. The YLLSDS used a four-point sub-scale with scores from zero to three (0 = no gain, 1 = slight gain, 2 = moderate gain, 3 = a lot of gain) and summated scores ranging from 0 to 90. Cronbach's alpha for the YLLSDS section in this study was .97.

Participation in FFA leadership activities was measured by a 25-indicator index adapted from Dormody and Seevers (1994). The index listed various FFA leadership activities that included individual and group experiences. In this study, an effort was made to group local activities near the beginning of the index so the majority of FFA members could indicate their participation. FFA members scored the index by indicating participation, ranging from zero to five (0 = no participation, 1 = local, 2 = district, 3 = state, 4 = regional, and 5 = national). Summated scores could range from 0 to 77. Cronbach's alpha for the FFA index in this study was .86.

Based on the literature review, a separate section was developed by the researcher to assess the level of selected Iowa FFA members' participation in youth leadership activities other than those offered by the National FFA Organization. This section was validated by a panel of six experts in agricultural education and the National FFA Organization. Iowa FFA members were asked to indicate their membership in other youth organizations and to compare their perceived "leadership development gain" to that of the National FFA Organization. Specific categories (school and community activities) were designed to assist the respondent in recording his/her responses. Each of the 20 nonFFA leadership activities was scored using the scale: 0 = No Participation, 1 = No Comparison to FFA, 2 = Some Comparison to FFA, 3 = Much Comparison to FFA, 4 = Very Much Comparison to FFA. Summated scores could range from 0 to 80. Cronbach's alpha for the nonFFA index was .67.

Achievement expectancy was assessed using a two-indicator summated scale adapted from Dormody and Seevers (1994). The first indicator asked Iowa FFA members to record the level of evaluation they expected to receive in their FFA activities and/or projects. The second indicator asked FFA members to record the level of performance they expected from themselves while participating in FFA activities and/or projects. Both indicators had levels that ranged from outstanding to poor. Both indicators were summed, with scale scores ranging from zero to eight. Cronbach's alpha for the achievement expectancy scale in this study was .80.

The demographics' section included questions asking FFA members to record their years of membership in the FFA, age, current place of residence, gender, and average grades received in high school.

The target population for this study was all Iowa FFA members registered in the 1994-1995 Iowa FFA membership roster. From this roster, the population of Iowa FFA members was 10,186; a sample size of 371 was needed to represent this population (Krejcie & Morgan, 1970). For ease of questionnaire administration, the sample was increased to 400.

Data were collected from February to April 1995. A copy of the Iowa FFA Youth Leadership Life Skills Development Questionnaire with coded numbers, a cover letter, and a self-addressed stamped envelope was mailed to the 400 selected Iowa FFA members at their home addresses. No incentive to complete the questionnaire was offered. A total of 282 usable questionnaires (70.5%) was received during the data collection period that included two-week postcard reminders and two additional instrument mailings.

To check for nonresponse bias, a random sample of the remaining nonrespondents was drawn, totaling 100 Iowa FFA members. A total of 34 valid questionnaires was returned. Nonrespondents were compared statistically to respondents by YLLSDS scores, age, and gender. There were no statistical differences between nonrespondents and respondents. Borg and Gall (1989) recommend that if no significant differences are found when the responses of the initial respondents are compared with those of the nonrespondent sample, then the researcher can reasonably assume that the respondents represent an unbiased sample of all who receive the questionnaire. Nonrespondents' data were compiled with respondents' data, yielding a total response rate of 79% (N = 316).

Means, frequencies, modes, standard deviations, percentages, reliability, bivariate and multivariate analyses were performed on the data to accomplish the objectives of this study. The significance level of .05 was set *a priori* for all inferential statistics.

Findings

Objective One: Iowa FFA members' YLLSDS scores ranged from 0 to 90 with a median of 65. The FFA youth had a composite mean of 62.65, with a standard deviation of 17.83 (Table 1). Using a scale of 0 to 3, analysis of individual survey items revealed the top three grand item means were: "get along with others" (M = 2.37, SD = .79); "respect others" (M = 2.34, SD = .77); and "show a responsible attitude" (M = 2.28, SD = .79). The statements receiving lowest grand item means were: "can determine needs" (M = 1.78, SD = .73); "can express feelings" (M = 1.82, SD = .94); and "am sensitive to others" (M = 1.89, SD = .90).

Scores on the participation in FFA leadership activities index ranged from 0 to 60 (M = 19.94, SD = 12.62) with a median of 17.5 (Table 1). Among all FFA activities listed, FFA members participated most actively in chapter meetings (n = 301), fundraising (n = 280), and chapter banquet (n = 269). They were least active in the Washington conference program (n = 26), agriscience recognition program (n = 41), and summer leadership camp (n = 68).

Summated scores for the participation in nonFFA leadership activities index resulted in an overall range of 0 to 45 (M = 10.25, SD = 6.73) with a median of 9.0 (Table 1). Among all school and community activities listed, Iowa FFA members indicated highest comparative leadership opportunities from participation in sports (n = 245), church groups (n = 235), and after school jobs (n = 206). The least amount of comparative leadership opportunities occurred in VICA Clubs (n = 8), DECA Clubs (n = 9), and FHA-HERO Clubs (n = 10).

Summated scores for the achievement expectancy scale ranged from 0 to 8 (M = 6.06, SD = 1.47) with a median of 6.0 (Table 1). Iowa FFA members' cumulative years in the FFA ranged from 1 to 7 (M = 2.62, SD = 1.48) with a median of 2 years. FFA members' reported ages ranged from 14 to 21 (M = 16.6, SD = 1.56) with a median of 16 years of age.

Table 1. Descriptive statistics for interval and ratio data variables (N = 316)

Variable	Mean	Median	SD[a]
Youth leadership and life skills development	62.65[b]	65.00	17.83
Participation in FFA leadership activities	19.94[c]	17.50	12.62
Participation in nonFFA leadership activities	10.25[d]	9.00	6.73
Achievement expectancy	6.06[e]	6.00	1.47
Years in the FFA	2.62[f]	2.00	1.48
Age	16.60	16.00	1.56

[a] Standard deviation.
[b] Summated scale values of 0 to 90.
[c] Summated scale values of 0 to 77.
[d] Summated scale values of 0 to 80.
[e] Summated scale values of 0 to 8.
[f] Scale values of 1 to 11 or more.

More than half of Iowa FFA members (n = 192) were from a farm (Table 2). Exactly one-half (n = 158) of the selected Iowa FFA members indicated the cumulative grade averages they had received during high school was a 3.0, on a scale of 1.0 to 4.0. The majority of Iowa FFA members (n = 237) responding to this survey were male. The variable gender was dummy coded, with males coded as 1 and females coded as 0. To put categorical variables such as gender into a regression equation, they need to be recoded as binary variables (Ary, Jacobs, & Razavieh, 1996).

Table 2. Descriptive statistics for nominal & ordinal data variables

Variable	Category	Frequency	Percent
Place of residence	Farm	192	60.8
	Rural nonfarm or town <10,000	99	31.3
	Town or city 10,000 to 50,000	21	6.6
	Suburb or city >50,000	4	1.3
Cumulative grades	Mostly A's	92	29.1
	Mostly B's	158	50.0
	Mostly C's	62	19.6
	Mostly D's	3	0.9
Gender	Female	79	25.0
	Male	237	75.0

Objective Two: The magnitude of relationships reported is based on the recommendations of Hinkle, Wiersma, and Jurs (1994, p. 119). The strongest statistically significant relationship existed between YLLSDS and FFA leadership activities ($r = .37$), $r(314) = .16$, $p < .05$. This association was followed by years of membership in the FFA ($r = .31$), age ($r = .27$), jobs ($r = .17$), achievement expectancy ($r = .17$), club officer ($r = .17$), church groups ($r = .16$), and class officer ($r = .15$). The independent variable "gender" had a low negative relationship ($r = -.15$) with the dependent variable. This result illustrates that although Iowa FFA members numbered 7 males to 3 females (A. O'Neal, personal communication, May 18, 1995), indicating a representative sample, female FFA members responding to this study significantly outscored their male counterparts on the YLLSDS section of the Iowa FFA YLLSDS Questionnaire.

To complete objective two, multivariate analyses of data were performed using the "forced entry multiple regression" procedure. This method was chosen because it allows all independent variables to be entered into, and remain in, the multiple linear equation (Pedhazur, 1982). In the first analysis, a total of 23 explanatory variables was entered into the equation to determine the best fit for the multiple regression model. The amount of variance explained in youth leadership and life skills development scores was attributed to all the statistically significant independent variables within the multiple regression equation.

The findings from the first multivariate analysis of data revealed the independent variable, "FFA leadership activity," was statistically significant ($t = 4.562$) for the explanation of variance in YLLSDS scores. Other statistically significant independent variables accounting for the explanation of variance in the dependent variable included gender, self-reported cumulative grades, after school jobs, and years in the FFA (Table 3).

Table 3. Summary of forced entry regression on the dependent and independent variables

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	*F*-Ratio	*F*-Prob.
Regression	6	22211.819	3701.969	14.702	0.000
Residual	308	77556.158	251.806		

Variable	B	SE B	Beta	T	Sig. T
(YLLSDS)	59.379	4.895		12.130	0.000
FFA Activity	0.401	0.088	0.284	4.562	0.000*
Club Officer	1.225	0.719	0.090	1.702	0.089
Jobs	2.036	0.605	0.169	3.362	0.001*
Years in the FFA	2.049	0.723	0.170	2.832	0.005*
Cumulative Grades	-3.241	1.333	-0.131	-2.431	0.016*
Gender	-5.887	2.162	-0.143	-2.723	0.007*

*p<.05

The results from the first analysis revealed a total of 25.4% of the variance in youth leadership and life skills development scores was accounted for by a combination of significant independent variables. Upon elimination of independent variables with high intercorrelations, a total of 22.3% of the variance in YLLSDS scores was accounted for by the statistically significant independent variables (Table 4).

Table 4. *R* square Comparison

Forced Entry Multiple Regression Equation	Multiple *R*	*R* Square	Adjusted *R* Square	Standard Error
First multiple regression model	0.5037	0.2537	0.1945	15.9977
Second multiple regression model	0.4718	0.2226	0.2075	15.8684

Objective Three: To complete this objective, the grand mean YLLSDS score in this study (N = 316, M = 62.65) was compared statistically with the score obtained in the study by Dormody and Seevers (1994) in Arizona, Colorado and New Mexico (N = 255, M = 64.2). The test failed to verify that a significant difference existed between the study by Dormody and Seevers (1994) and this study.

Conclusions

The construct of youth leadership and life skills development is a complex arrangement of experiences, backgrounds, and attitudes, when measured by the perceptions of secondary agricultural education students. Leadership and life skill development were defined as skills in communications, decision making, interpersonal relationships, learning, resource management, understanding self, and working with groups.

Positive relationships existed between YLLSDS scores and FFA leadership activities (chapter meetings, fundraising events, chapter banquets, SAE projects, being an FFA committee member) and membership in the FFA. NonFFA youth leadership activities included participation in sports, church groups, after school jobs, and 4-H clubs, however "after school jobs" was the only statistically significant nonFFA activity in the multiple regression model. The variable gender had a low negative relationship with YLLSDS scores, based on the binary coding of males = 1 and females = 0. Greater cooperation among agricultural educators, business and industry representatives, and other youth organization advisors is needed to foster an environment that is conducive to building leadership and life skill development for all youth at the secondary level.

Participation in FFA leadership activities, in combination with the variables after school jobs, years in the FFA, self-reported cumulative grades, and gender, accounted for 22.3% of the variance in youth leadership and life skills development scores. When comparing YLLSDS grand mean scores, no statistical difference existed between this study and the study by Dormody and Seevers (1994). Dormody and Seevers (1994) found achievement expectancy, FFA activities, and gender accounted for 16.7% of the variance in YLLSDS scores. As an addition to the body of knowledge surrounding youth leadership and life skills development, this study has revealed an increase in the overall amount of variance explained for this concept. With less than 25% of the variance explained in the phenomenon known as leadership development, the Agricultural Education profession has much to discover.

Implications and Recommendations

Agricultural students at the secondary level could increase their leadership skills in communications, decision making, getting along with others, learning, management of self, understanding self, and working with groups, by participating in a combination of youth leadership organizations in school and/or community activities. Agricultural educators should stress the importance of academic success and the value of becoming involved in a variety of intra- and extracurricular activities that promote youth leadership and life skills development.

FFA advisors and other youth organization advisors should place more emphasis on working collaboratively to improve the total youth leadership program. Additional research is needed in determining which combination of agricultural and nonagricultural youth leadership activities would provide the most gain in youth leadership and life skills development.

Research studies are needed to further advance the theory of youth leadership and life skills development and its role in preparing youth to become responsible, productive citizens. Additional research is needed in determining other variables that may contribute to the explanation of variance in youth leadership and life skills development scores.

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A Critique

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The authors pose the million dollar question that we as board members and stake holders in the FFA frequently ask: How does participation in the FFA contribute to student leadership development? Are we really helping agricultural education students become leaders? I commend the authors for investigating this important topic and attempting to distinguish between the concepts of youth leadership and life skills development.

The paper includes an excellent review of the literature related to the outcomes of participation in youth leadership activities as well as importance of developing life skills. I was intrigued by the statement that the striking similarities between the SCANS Report and the primary purposes of the National FFA Organization were similar and that those similarities described as the development of leadership and life skills served as a framework for this study. Do the results of this study support this theoretical framework? Are FFA activities providing students with life skills and needed personal qualities?

The study's purpose and objectives are clearly stated and addressed in the findings, conclusions and recommendations. The authors are to be commended on their use of previous research and instrumentation to further the knowledge base. Also, the authors were not satisfied to simply replicate a study but rather strengthened their study by developing new sections while incorporating the best of other researchers. I was impressed that the researchers went beyond their own FFA backyard and explored the impact of other youth activities. Research procedures were appropriate although I wonder what Krejcie and Morgan would say about adding another 29 cases for ease of questionnaire administration.

It was interesting to note that more than half of Iowa's FFA members was from farms. Add to that another 31% from rural nonfarm or towns. Could this background have some influence on the FFA member's YLLSDS scores? The significance of gender and after school jobs in the findings was also interesting. Why did the females score higher? What kind of after school jobs are most beneficial for students?

The authors statistically compared this study and the Dormondy and Seevers study. The authors indicated that they made a few revisions in the instrumentation. What affect, if any, did these revisions have on making a statistical comparison or the two grand mean scores?

Finally the conclusions and recommendations provide us with food for thought. How does the FFA's purpose and proposed leadership activities compare to the concepts being taught and the experiences of the non-FFA organizations? What should the FFA be doing to better prepare future leaders? Are the activities we conduct really contributing to the skills we desire in the SCANS report? Congratulations on an excellent study.

Concurrent Session L

Theme:
Distance Education

Chairperson:
William L. Thuemmel
University of Massachusetts

Discussant:
Donald M. Johnson
University of Arkansas

Facilitator:
Randall J. Andreasen
Iowa State University

A Comparison of Interaction Needs and Performance of Distance Learners in Synchronous and Asynchronous Classes
W. Wade Miller, Iowa State University
Jill King Webster, Iowa State University

A Comparison of Traditional and Computer-Based Delivery Methods for Cross-Cultural Training for Agriculturalists
Theresa Pesl Murphrey, Texas A & M
James E. Christiansen, Texas A&M

Predicting Student Achievement in Agriculture Courses Delivered by Videotape
Greg Miller, Iowa State University

Teaching Evaluation Skills Using Experiential Learning
Linda Wulff-Risner
University of Missouri-Columbia
Bob R. Stewart
University of Missouri-Columbia

A Comparison Of Interaction Needs And Performance Of Distance Learners In Synchronous And Asynchronous Classes*

W. Wade Miller
Iowa State University

Jill King Webster
Iowa State University

Introduction/Theoretical Framework

Making education accessible to adult learners through the use of communication technologies and instructional systems has certainly brought a change in education, and agricultural education programs are no exception. The use of distance education in agricultural education has increased the educational opportunities for many adult learners. Agricultural educators use distance education to provide educational opportunities to adults who would not otherwise have access due to the constraints imposed by work, family, and social commitments (Schoenfelder, 1995).

Because distance education is a growing alternative to traditional classroom instruction, a learner's ability to interact with the instructor is very important (Main, 1995). Acker and McCain stated that "interaction is central to the social expectations of education in the broadest sense and is in itself a primary goal of the larger educational process and that feedback between learner and teacher is necessary for education to develop and improve" (Acker & McCain, 1993, p.11). Kearsley (1995), stated:

> One of the most important instructional elements of contemporary distance education is interaction. It is widely held that a high level of interaction is desirable and positively affects the effectiveness of any distance education course. However, it is not clear from research or evaluation data that interaction does improve the quality of learning in most distance education programs (p.366).

Interaction has been described as important to the instructional process and as one of the central issues related to distance education today (Jackson, 1994; Main, 1995). The types and quality of interaction provided in distance education courses concerns educators because earner satisfaction and perceived learning are affected by interaction (Scholdt, 1995).

Today distance education opportunities are offered through a wide variety of media (Schlosser & Anderson, 1993). These media allow instructors to deliver their courses both live and delayed through the use of video storage mechanisms. This has led to the dividing of interaction in distance education into two categories; synchronous and asynchronous. Willis defined synchronous interaction as being "real-time, live and conversation-like during the instructional setting," asynchronous as "delayed, before or after the instructional session (Willis, 1994, p.46)."

Do interaction needs vary with delivery method? Can interaction take place in a delayed setting? Is interaction related to learner performance? Research needs to be conducted by researchers in this area that will enable educators to understand the interaction needs of learners and develop agricultural distance courses that will meet those needs.

Purpose/Objectives

The purpose of this study was to determine if perceived learner interaction needs and performance in agricultural courses taught via distance education through the Off-Campus Professional Agriculture Program at Iowa State University were different based on the delivery system of the course -- synchronous versus asynchronous. The objectives are as follows:

1. Describe selected demographic characteristics of learners enrolled in courses offered through the Off-Campus Professional Agriculture Program.
2. Determine if learner interaction needs are different in courses delivered by synchronous versus asynchronous methods.
3. Determine if learner performance is different in courses delivered by sychronous versus asynchronous methods.

Methods/Procedures

The research undertaken was descriptive in nature. The population for the study consisted of all learners enrolled in distance education courses administered through the Off-Campus Professional Agriculture Program at Iowa State University during the Spring semesters of 1995 and 1996, and the Fall Semester of 1995. A census was used to collect data.

Data were collected on 313 students from the following courses: Applied Non-Ruminant Nutrition (AnS 512), Wildlife and Agriculture (A Ecl 130), Advanced Crop Management (Agron 542), Agricultural Safety and Health (AST 436X), Principles of Crop Production (Agron 114), Agricultural and Extension Education in Developing Countries (AgEdS 561), Fundamentals of Entomology and Pest Management (Ent 376), Leadership Programs in Agriculture (AgEdS 315), Agricultural Markets (Econ 334), Biochemistry and Biophysics (BB405), Vegetable Crop Production (Hort 471), Workshop in Statistics (Stat 493), Instructional and Organizational Problems of Beginning Professionals in Agriculture (AgEdS 511), Biochemistry (BB 404), Models of Community (Soc 533), and Agricultural Meteorology (Agron 541). The courses were offered through traditional classroom format (face-to-face), over the Iowa Communications Network (ICN), and via videotape.

As a point of clarification to the reader, the ICN (Iowa Communication Network) is an end-to-end fiber optic digital transmission, error-free data transport, and sharp, crisp two-way voice communications. The network links Iowa's schools, public universities, community colleges, independent colleges, government offices and libraries. These facilities are available to Iowans through access points in each of the state's 99 counties, thus making everyone within 20 minutes of an ICN user site.

The questionnaire utilized in the study was developed by the researchers and consisted of an interaction statements section and a demographics section. Content and face validity were established by a panel of experts in agricultural education. A pilot test was conducted using past learners of distance education courses offered through the Off-Campus Professional Agriculture Program. Cronbach's alpha was used to estimate the internal consistency of the instrument. The reliability coefficient for the pilot test was .93. No changes were made to the instrument after the pilot test. The reliability coefficient was .95 for the Spring 1995 study respondents and .93 for the Fall 1995 and Spring 1996 respondents.

The 68 interaction statements were measured using a Likert-type scale which ranged from extremely negative (1) to extremely positive (8), and included a does not apply (9) response category. The statements were developed from a review of relevant literature and instruments used for similar purposes in other studies. Each statement asked the learner to read the statement and circle the number which represented the extent to which they felt the experience to be a positive or negative in relationship to their learning.

The questionnaire, along with a cover letter and a stamped return envelope, was sent to each learner. Ten days after the initial mailing a follow-up letter was sent to all non-respondents. Approximately one month after the first mailing a second complete mailing was sent to remaining non-respondents. Two hundred and twenty-one of the 313 learners completed and returned the questionnaire for a response rate of 71%.

All data were analyzed with the SPSS/PC+ computer program. Statistics used were frequencies, percents, standard deviations, ANOVA, Chi-Square, and t-tests. The alpha level was set a priori at .05.

Results/Findings

The data collected from the respondents was placed in two groups for analysis depending on the delivery method by which the learners completed their course work: synchronous or asynchronous. The synchronous group included learners enrolled in face-to-face and ICN courses. It should be noted that the learners who took classes face-to-face did so in an ICN setting; they were the learners at the origination site for the course. Learners enrolled in videotaped courses accounted for the asynchronous group.

The learners who participated in the study ranged in age from 19 to 58 years. The mean age of learners was 35.60 with a standard deviation of 9.17. Seventy-six percent (168) of the learners in the study were male.

The learners indicated that 82% (178) of them were part-time learners. The learners were asked to report their current martial status. Sixty-six percent (146) were married, 28% (62) were single, and five percent (12) were divorced.

Table 1 shows that farming was the occupation of 33 percent (57) of the asynchronous learners yet only 16% (7) of the synchronous learners were farmers. The synchronous learners were employed more often in agribusiness or agricultural education related occupations. Approximately 30% (66) of each group of learners listed "other" as their occupation due to the fact that they had more than one occupation. Generally they indicated that they farmed and earned income from some other agricultural occupation.

Table 1
Occupation of Learners Enrolled in the Off-Campus Professional Agriculture Program Based Upon Delivery Method

Occupation	Synchronous		Asynchronous	
	f	%	f	%
Farming	7	15.9	57	33.3
Agribusiness	10	22.7	44	25.7
Agricultural Extension	4	9.1	5	2.9
Agricultural Education	10	22.7	12	7.0
Other	13	29.5	53	31.0
Total	44	100.0	173	100.0

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Table 2
Learners Reason for Enrolling in the Off-Campus Professional Agriculture Program Based Upon Delivery Method

Reason	Synchronous		Asynchronous	
	f	%	f	%
Pursuing a degree	26	60.5	117	70.1
To improve my business/ career performance	13	30.1	31	18.6
For personal interest/hobby	2	4.7	6	3.6
Other	2	4.7	13	7.7
Total	43	100.0	167	100.0

Table 2 shows that sixty-one percent of the synchronous and seventy percent of the asynchronous learners indicated that they enrolled in the courses to pursue a degree; however, many learners from both groups were interested in improving their business or career performance.

Table 3 reveals that seventy-five percent of the synchronous and asynchronous learners indicated that overall they were satisfied to very satisfied with their class. A Chi-Square test was used to compare the distributions by delivery method. No difference in the distributions was detected. The vast majority of learners (95%) also indicated that they would take another course taught using distance learning.

The learners were asked to read sixty-eight interaction statements and circle a number, from one to eight, that indicated the extent to which they felt the statement was either a positive or negative learning experience. If the learner felt the experience did not apply to them, they were instructed to circle the number nine which represented "does not apply."

Table 4 shows the learners responses to the 18 statements from the interaction scale. The majority of learners indicated that they felt that experiences aimed at interaction between the learner and instructor were slightly to very positively related to their learning. They also indicated that they felt instructor interest, teaching skills, and personal interaction with the learners aided the learning process. Opportunities to discuss assignments and/or course work with instructors was viewed positively by both groups of learners.

Table 3
Learners Overall Satisfaction With Their Off-Campus Professional Agriculture Program Class Based Upon Delivery Method.

Satisfaction	Synchronous		Asynchronous	
	f	%	f	%
Very Dissatisfied	3	6.8	10	6.0
Dissatisfied	2	4.5	2	1.1
Somewhat Dissatisfied	1	2.3	10	6.0
Somewhat Satisfied	5	11.4	20	12.0
Satisfied	17	38.6	84	50.3
Very Satisfied	16	36.4	41	24.6
Total	44	100.0	167	100.0

Table 4 also shows that learners taking courses asynchronously felt that self-regulation of learning was more important than did the respondents in the synchronous group. However, both groups indicated that being physically separated from the teacher did not pose a considerable challenge to learning. They also indicated that they felt personal enthusiasm for their classes was moderately to very positively related to their learning.

Scheduling time to work on class assignments was felt to be moderately positively related to learning by all the learners. The asynchronous learners indicated that they did not feel that learning individually was a hindrance to their education but synchronous ICN learners indicated a dislike for being the only learner at a particular learning site.

The effect of poor instructor use of distance education technology was felt to be slightly negative by each of the groups of learners, with the synchronous learners believing it to be most negative. The learners also felt that talking during class, being ignored by the instructor, and the instructor treating some class members differently than others was also negatively related to their learning.

Table 4
Mean Scores for Selected Statements Related to Interaction by Delivery Method

	Delivery Method	
Statement (in order of appearance on questionnaire)	Synchronous	Asynchronous
Discussing class assignments with instructor during class time.	6.27	4.79
Talking informally with instructor.	6.53	6.50
Privately discussing course work with other learners.	6.29	6.12
Instructor makes eye contact with me.	6.53	6.43
Instructor treats some members of the class differently than others.	3.56	3.28
Class members talking during class (interrupting teacher).	3.62	3.32
Instructor shows personal interest in my class work.	6.55	6.54
Instructor ignores me during class.	3.00	3.03
Instructor uses a variety of audio-visual aids in class.	6.97	6.95
Poor instructor use of distance education technology.	4.18	4.47
Being physically separated from the teacher (such as being in a remote location).	4.54	5.07
Instructor provides learner(s) remarks concerning class.	6.71	6.68
Self-regulation (control) of learning.	6.36	6.51
Personal enthusiasm for class.	6.05	6.79
Instructor visiting off-campus site classes.	5.94	5.94
Help from remote-site technicians.	5.68	5.73
Scheduling time to work on class assignments.	5.91	5.94
Being the only learner at a remote site	4.43	5.16

Note: Based on Scale: 1= Extremely negative; 2 = Very negative; 3 = Moderately negative; 4 = Slightly negative; 5 = Slightly positive; 6 = Moderately positive;
7 = Very positive; 8 = Extremely positive

After analyzing each interaction item individually a grand mean for interaction was obtained. A t-test was utilized to compare the means of the two groups. When the interaction scale was compared to the learners' interaction needs based upon delivery method no difference was found at the .05 level of significance.

Table 5 indicates that over 60 percent of asynchronous learners felt that items relating to interaction with the instructor did not apply to their learning. The asynchronous learners also did not indicate a need for as much guidance from the instructor as did their synchronous counterparts.

It was interesting to note that 42 percent of the asynchronous learners felt "using computers outside of class," did not apply to their learning experience while only 23 percent of the synchronous responded similarly. The asynchronous learners also demonstrated less of a need for involvement and support from their classmates as did the synchronous learners.

Seldom did the asynchronous learner indicate that a statement "did not apply" less frequently than did the synchronous learner. However, an example of one statement where the synchronous chose "does not apply" less often than the asynchronous learners was "program support staff."

Table 6 reveals that over half of the learners' received an "A" as their final grade for the course they took via the Off-Campus Professional Agriculture Program regardless of delivery method. An additional 20 percent (23) of the synchronous and 16 percent (26) of the asynchronous learners received a "B" as their final course grade. The asynchronous learner population also accounted for the largest percentage of learners reporting a grade of "Incomplete." Of the 29 learners receiving no grade, 83% (24) were learners who took their course via asynchronous delivery. A Chi-Square analysis was used to compare the grade distributions of the two groups. When final course grades (excluding the no grade category) were compared to the learners' interaction needs based upon delivery method no difference in the grade distributions was found.

Table 5
Interaction Statements Selected by Students' As Not Applying To Their Learning By Delivery Method

Statement (in order of appearance on questionnaire)	Percent Choosing "Does Not Apply" Synchronous	Percent Choosing "Does Not Apply" Asynchronous
Discussing class assignments with other students during class time.	2.3	62.2
Instructor makes eye contact with me.	22.7	64.5
Using computers outside of class	22.7	42.4
Having personal active involvement in the class.	6.8	49.4
Instructor provides students' guidance regarding class assignments.	4.5	23.4
Classmates enthusiasm for class.	4.5	41.9
Program support staff.	20.5	6.4
Peer evaluation of my class work.	38.6	62.0

Note: Based on Scale: 1= Extremely negative; 2 = Very negative; 3 = Moderately negative; 4 = Slightly negative; 5 = Slightly positive; 6 = Moderately positive;
7 = Very positive; 8 = Extremely positive

Table 6
Final Course Grades of Students Enrolled in the Off-Campus Professional Agriculture Program Based Upon Delivery Method

Grade	Synchronous		Asynchronous	
	f	%	f	%
"A"	23	56.1	97	59.1
"B'	8	19.5	26	15.9
"C"	4	9.8	15	9.1
"D"	1	2.4	1	.6
"F"	0	0.0	1	.6
"Incomplete"	5	12.2	24	14.6
Total	41	100.0	164	100.0

Conclusions/Recommendations/Implications

Educators of agricultural distance education courses should be aware of the differences in interaction needs of their learners. The results of this study indicate that the interaction needs of synchronous and asynchronous learners, while similar in general, vary on individual items based upon the delivery method used for the course.

Regardless of delivery method, the learners' enrolled in these classes were overall satisfied to very satisfied. Studies such as this one are valuable in documenting the desirability of distance learning. Biner, et. al, (1994) concluded that high learner satisfaction could benefit distance education by promoting distance education programs, motivating learners, increasing enrollment, improving learning, and decreasing attrition rates.

The data from this study suggest that instructors need personal contact with all learners regardless of delivery method. Instructors should use this personal contact to clarify course assignments and expectations. A study by Rodriguez (1995), found that learners and professors believed that such interaction enhanced communications, improved teaching and learner interest in content matter. The respondents also indicated a slight desire for interaction between learners regardless of delivery method. Teachers educators should be aware of this desire and plan activities which incorporate interpersonal interaction into their courses.

It was interesting to note that learners taking courses asynchronously did not perceive interaction to be as important to their learning as did learners taking courses synchronously. However, when the asynchronous learners expressed a need for interaction, their responses were similar to the synchronous learners. Adult distance education learners have been described as learners possessing strong motivation, study skills, and discipline (Schoenfelder, 1995). Perhaps those learners who possess these traits do not require as much interaction as learners without these traits. Although the asynchronous learners indicated a desire for more control over their learning than synchronous learners the researchers question whether or not these individuals might learn better if interaction was improved.

Additionally, might the lack of interaction in many distance education courses be part of the reason behind the high attrition rate commonly found in distance education? In this study 10% of the learners received no grade. Could this be attributed to a lack of interaction within their selected course. Also of concern is the fact that of the learners receiving no grade, 83% took their course asynchronously. Although the asynchronous learners indicated that they did not feel that interaction was as important to their learning as the synchronous learners, could a lack of interaction account for some of these learners not completing their course on time. It is interesting to note, that course grades regardless of method, but completion rates are different.

As distance learning becomes more common in education, interaction will become a more pedagogically important issue. Further research needs to be conducted with these populations to determine how differences in interaction needs, based upon delivery method, should be addressed by agricultural distance educators.

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A Comparison of Interaction Needs and Performance of Distance Learners in Synchronous and Asynchronous Classes

A Critique

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The introduction to this paper is well-written, concise, and provides the reader with information necessary to put the research into context. The operational definitions of "synchronous" and "asynchronous" interactions are clearly delineated on the first page of the manuscript.

Overall, this is an excellent paper on a timely topic, written by researchers with both expertise and a sustained record of scholarly inquiry in this area of research. These qualities are admirable and certainly worthy of emulation by all in the profession.

The purpose and objectives of the research are clearly stated. However, I am not certain that the wording of the purpose and objectives matches the research reported. In particular, the phrase, "learner interaction *needs*," [italics added] appears in both the title and the purpose and objectives section, leading the reader to assume that either actual or perceived learner needs for interaction and its relationship to performance will be assessed. However, in the methods section, no mention is made of needs, and the discussion switches to "the extent to which they [the respondents] felt the [interaction] experiences to be a positive or a negative in relationship to their learning." Later, in the results section, the reader finds that, one group of learners felt that certain interaction characteristics were "more *important*" [italics added] than did the other group of learners.

What is being measured and reported? Is it interaction needs, the perceived importance of interaction, or student perceptions of the effects of different interaction experiences on their learning? Table 4 and the discussion pertaining to it, indicate that the last option is correct.

Does the foregoing have any importance in interpreting the results of the study, or does it simply provide a discussant with two paragraphs with which to fill a page usually not read by anyone except the authors? Without totally discounting the latter possibility, I believe that it makes a big difference.-
Here is one of many possible examples of why this is true. In Table 5 we learn that almost two-thirds (62.2%) of the asynchronous learners chose the "does not apply" option when rating the effects of the interaction characteristic, "Discussing class assignments with other students during class time." Does this mean that asynchronous learners: (a) do not have a "need" in this area, or (b) do not feel this is "important," or is it that they (c) simply did not have the opportunity to discuss class assignments with other students during class time? If a need is defined as the difference between a present and desired condition, one cannot logically infer a lack of "need" based on a lack of "opportunity." In fact, such a difference would seem to indicate a definite need.

This is an excellent paper. It makes an important contribution to the distance education literature, and is worthy of widespread dissemination. But, before this is done, I urge the authors to bring additional focus to the issue through clarity of thought and expression.

A Comparison of Traditional And Computer-Based Delivery Methods For Cross-cultural Training For Agriculturalists

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Introduction

The world is rapidly moving toward a more global economy, a fact to which agricultural educators must respond by developing educational programs to ensure that agricultural students and professionals will be prepared to meet the challenges and opportunities being created in today's global village.

> Over the past decade or so, the world economy has changed profoundly: it has become a truly global system. International trade has grown rapidly; international flows of money have grown explosively. Economic booms spread more readily from country to country, and so do recessions. Interest rates in one economy affect investments in others. Capital roams freely around the world. Without a doubt, these changes have great implications for the ways people, firms, and governments go about their business. The increasing "globalization" of the world economy is a fact, and one that nobody can ignore ("The myth," 1995, p. 15).

Education serves a very important role in society by ensuring continuous development of a competent workforce. Agricultural educators are specifically responsible for ensuring that agricultural students and professionals receive proper training to function competently in the global agricultural environment. "As American workplaces become more culturally diverse and more globally dependent, conflicts between different cultures have become more frequent" (York, 1995, p. 424). Cross-cultural training, learning how to work with individuals from cultures different from one's own, has thus become an increasingly important component of globalization training. However, in many cases, cross-cultural training is not available or easily accessible to agricultural students and professionals. A study conducted by Vernon Luft at the University of Nevada (1996) revealed that courses that deal with the culturally diverse are needed to increase the sensitivity of individuals to diversity. With this in mind, it is important for agricultural educators to take the necessary steps to ensure that cross-cultural training is provided to agricultural students and professionals. New technology may offer agricultural educators an opportunity to fill this educational need.

Advances in technology, specifically computer-based instruction, may be creating an opportunity to provide cross-cultural training to many agricultural students and professionals who previously did not have access to this training. Computer-based instruction has been shown to deliver high quality training, assist the educational process, require less time to achieve the same amount of training, and cost less than instructor-led training ("Multimedia training," 1995). Although computer-based instruction has been found to be an effective educational tool in engineering, microbiology, anatomy, and medical education programs (Fasce, Ramirez, & Ibanez, 1995; Inglis, Fu, & Kwokchan, 1995; Jones & Kane, 1994; Tothcohen, 1995), only limited research has been focused on agriculture.

Purpose and Objectives

The purpose of this study was to determine the effectiveness of computer-based instruction to deliver a cross-cultural module to undergraduate agricultural students enrolled in a university. The objectives developed to guide the study were as follows:

(1) Determine the cross-cultural knowledge baseline of students prior to exposure to a cross-cultural module.
(2) Determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via traditional classroom instruction.
(3) Determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via computer-based instruction.
(4) Compare and contrast the cross-cultural knowledge level of students exposed to the computer-based instruction with students exposed to the traditional classroom instruction and to each of their respective baselines.
(5) Determine the cross-cultural knowledge level of all students after a two to four-week lapse in time from their initial exposure to the cross-cultural module.
(6) Determine the perceptions of students concerning the appropriateness of computer programs as educational tools.
(7) Determine if there is a relationship between selected personal characteristics and the cross-cultural knowledge level of students in both the control and treatment groups.

Research Methods and Procedures

The research design used was a quasi-experimental research method known as a nonequivalent control-group design (Borg & Gall, 1989). The nonequivalent control group research design was selected because this study involved the testing of intact groups and did not allow for random assignment of subjects to the groups. The primary strength of this design is that baseline data are collected at the outset of the experiment. The establishment of baseline data is an important tool in making meaningful comparisons (Isaac & Michael, 1981). The steps of the research method involved:

(1) Assigning each class to one of two groups -- a control group (traditional classroom instruction) and a treatment group (computer-based instruction).
(2) Administering a pretest to all students in both groups to establish baseline data in regard to cross-cultural knowledge.
(3) Administering a treatment (computer-based instruction) to the treatment group.
(4) Administering traditional classroom instruction to the control group.
(5) Administering a posttest to both the control group (traditional classroom instruction) and the treatment group (computer-based instruction) five weeks following the administration of the pretest.
(6) Administering a post posttest to both the control group (traditional classroom instruction) and the treatment group (computer-based instruction) five weeks following the administration of the posttest.

In brief, the focus of the research was to assess the effectiveness of the means of delivery of instruction and not the content. The content was the same in both methods of delivery.

The population consisted of sixty-eight students enrolled in the non-honors sections of the undergraduate course, Agricultural Education (AGED) 440, "Principles of Technological Change," during the Fall 1996 semester at Texas A&M University in College Station, Texas. Of the sixty-eight students enrolled in the class, sixty students (88%) participated in one or more parts of the study. The population was limited to the twenty-six students (38%) identified who were exposed to the cross-cultural educational module and who completed all of the instruments, properly and completely.

The cross-cultural module was created by the researcher following an extensive literature review and in consultation with cross-cultural experts regarding accuracy and appropriateness to ensure content validity of the materials. The module was developed in such a way as to enlighten students with respect to cultural diversity and also to provide information to assist them in dealing more effectively in the global environment. The content of the module consisted of five areas: 1) the "global village" concept, 2) an overview of American culture, 3) the importance of understanding one's own culture, 4) evaluating the cultural, political, and economic environment of a country, and 5) an introduction to culture shock. The traditional classroom instructional approach consisted of lecture and teacher/student interaction while the computer-based instruction was developed using Authorware®, an authoring software program, and included the use of multimedia (sound, motion, text, and graphics). Both approaches lasted approximately fifty minutes and both were pilot tested in the summer of 1996.

Three instruments developed by the researcher in consultation with experts in test development and cross-cultural knowledge were used to collect data: the pretest, the posttest, and the post posttest. The pretest consisted of fifty multiple choice questions designed to assess the cross-cultural knowledge of the students and sixteen multiple choice questions pertaining to individual student information designed to describe the population such as gender, age, race, computer experience, and international experience. The posttest consisted of the identical multiple choice questions designed to assess cross-cultural knowledge of the students that were used in the pretest, except that the questions were rearranged into a different order. The second part of the posttest consisted of twenty-four statements regarding the students' perceptions concerning the appropriateness of computer programs as educational tools. Students were asked to respond to a series of statements using a Likert-type scale by marking Strongly Agree, Agree, Unsure/No Opinion, Disagree, or Strongly Disagree. The post posttest consisted of the identical multiple choice questions designed to assess the cross-cultural knowledge of the students that were used in the previous pretest and posttest. The questions were once again rearranged into a different order. At no time did the researcher give feedback to the students as to what were the "correct" answers to the questions. This was done to ensure that the readability and interpretation of the questions were identical for each instrument. This was the rationale for not changing the wording of the questions. Each of the instruments was pilot tested and evaluated by the researcher for reliability. One question was eliminated due to an error in test development. Cronbach's coefficient alpha was used to quantify internal consistency for each instrument. Evaluation of the forty-nine knowledge questions used in each instrument resulted in the following coefficient alphas: Pretest = .61; Posttest = .80; and Post posttest = .77. Nunnally (1967) suggested that in the early stages of research a modest reliability of .50 or .60 will suffice. Thus, no additional questions were eliminated from the study. Cronbach's coefficient alpha was again used to quantify internal consistency for the statements relating to computer-based instruction and those relating to technology. Evaluation of the eleven statements relating to the perceptions of computer-based instruction resulted in a coefficient alpha of .87. Evaluation of the seven statements relating to the perceptions of technology resulted in a coefficient alpha of .78. Thus, no statements were eliminated from the study.

The null hypothesis for this study stated that no significant difference would exist between the knowledge level of students exposed to a cross-cultural educational module via traditional classroom instruction and those exposed to a cross-cultural educational module via computer-based instruction. Descriptive statistics, t-tests, and analysis of variance were used to analyze the data.

Findings

A comparison of the grade point averages for the control group (2.85) and the treatment group (2.86) revealed that the two groups were academically similar. The majority of the participants (92.3%) were enrolled in the College of Agriculture. The participants consisted of 50% males and 50% females and were predominately white (92.3%) with the remainder of the population (7.7%) being Hispanic. Enrollment records for the College of Agriculture and Life Sciences at Texas A&M University for the Fall 1996 semester revealed a similar distribution based on gender and race. Over 50% of the students were twenty-one years of age. More than half (65.4%) of the students reported having had moderate computer experience. No students reported having "no" computer experience. Slightly more than half of the participants (53.8%) reported that they did not own a computer. In regard to international experience, slightly less than half (46.2%) of the participants reported never traveling outside the United States for two days or less. An even higher percentage of participants (61.5%) reported not having traveled outside the United States for three days or more. More than half (58%) of the students believed that they will be involved in international activities in their future jobs. However, an even greater percentage of the students (75%) did not believe that cross-cultural training should be required of all students.

Objective 1 was to determine the cross-cultural knowledge baseline of the students in both the control group and the treatment group prior to exposure to the cross-cultural module. Scores attained by the control group ranged from 41 to 65 out of a possible score of 100. Scores attained by the treatment group ranged from 39 to 67. The control group attained a pretest mean score of 49 while the treatment group attained a mean score of 53. A *t*-test was conducted to determine if there were statistical differences between the control group and the treatment group based on their pretest scores. No significant difference was found between the two groups ($t = -1.302$, $p = .205$).

Objective 2 was to determine the cross-cultural knowledge level of students following exposure to a cross-cultural module delivered via traditional classroom instruction. The posttest scores for the students exposed to the traditional classroom instruction ranged from 47 to 86 out of a possible score of 100. Comparison of the posttest mean (64.05) to the pretest mean (49.15) revealed that the students did gain knowledge from the traditional classroom instruction. The results of a *t*-test ($t = 6.459$, $p < .001$) revealed that the students scored significantly higher on the posttest than the pretest.

Objective 3 was to determine the cross-cultural knowledge level of students following exposure to the cross-cultural module delivered via computer-based instruction. The students' posttest scores ranged from 65 to 84 out of a possible score of 100. Comparison of the posttest mean (73.78) to the pretest mean (53.06) revealed that the students did gain knowledge from exposure to the computer-based instruction. The results of a *t*-test ($t = 10.507$, $p < .001$) revealed that the students scored significantly higher on the posttest than the pretest.

Objective 4 was to compare and contrast the cross-cultural knowledge level of students exposed to the computer-based instruction with students exposed to the traditional classroom instruction. The statistical test analysis of variance was conducted with the pretest as a covariate to determine if a significant difference existed between the control group and treatment group posttest scores. As shown in Table 1, the difference between the control group and the treatment group posttest scores was significant (significant at .021), even when accounting for the pretest scores.

Objective 5 was to determine the cross-cultural knowledge level of all students following a two to four-week lapse in time from the students' initial exposure to the cross-cultural module. Post posttest scores attained by the control group ranged from 53 to 76 out of a possible score of 100. Post posttest scores attained by the treatment group ranged from 63 to 90. The control group attained a post posttest mean score of 65 while the treatment group attained a mean score of 74. Table 2 provides a listing of the mean scores achieved by the control group and the treatment group for each instrument. Comparison of the pretest, posttest, and post posttest scores received by the control group and the treatment group revealed that both groups had similar posttest and post posttest scores. Comparison of each group's posttest score to their corresponding post posttest score revealed that the control group (traditional classroom instruction) achieved only a slightly higher score on the post posttest while the treatment group (computer-based instruction) attained a much higher score on their post posttest than their posttest.

Table 1
Analysis of Variance of Pretest and Posttest Scores Using Group (Control and Treatment) and Pretest as Covariates and Posttest Results as the Dependent Variable, AGED 440, Texas A&M University, Fall 1996

Source	Sum of Squares	df	Mean Squared	F	Sig.
Pretest	532.73	1	532.73	9.98	.004
Test Group	325.97	1	325.97	6.11	.021
Model	1148.50	2	574.25	10.76	.001
Residual	1228.07	23	53.40		
Total	2376.57	25	95.06		

Table 2
Mean and Standard Deviations for the Control Group (Traditional Classroom Instruction, n=13) and the Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996

	Control		Treatment	
	Mean	Std. Dev.	Mean	Std. Dev.
Pretest	49.15	6.52	53.06	8.66
Posttest	64.05	2.92	73.78	6.00
Post Posttest	64.68	6.20	74.41	8.96

The statistical test of analysis of variance was conducted with the pretest as a covariate to determine if a significant difference existed between the post posttest scores of the control group and the treatment group. As shown by the Test Group (significant at .008) in Table 3, there was a significant difference between the post posttest scores attained by the control group and those attained by the treatment group.

Table 3
Analysis of Variance of Pretest and Post Posttest Scores Using Group (Control and Treatment) and Pretest as Covariates and Posttest Results as the Dependent Variable, AGED 440, Texas A&M University, Fall 1996

Source	Sum of Squares	df	Mean Squared	F	Sig.
Pretest	509.04	1	509.04	12.79	.002
Test Group	330.80	1	330.80	8.31	.008
Model	1124.81	2	562.40	14.13	.000
Residual	915.37	23	39.80		
Total	2040.17	25	81.61		

To test the null hypothesis that computer-based instruction elicits the same learning in regard to cross-cultural issues as traditional classroom instruction, pretest and posttest measures at two points in time were analyzed via a 2x2 analysis of variance (ANOVA). Instruction was provided to two groups of students using two methods (traditional classroom instruction and computer-based instruction) and the pretest was used as a covariate while stability of knowledge was the "within subject" variable. As revealed in Table 4, the two groups' (the control group and the treatment group) average of the posttest and post posttest scores were statistically significantly different (.005) from one another. The Eta Squared value of .291 revealed that the treatment accounts for much of the variability between the groups. In addition, the significance (.985) noted within subjects reveals that there was not a significant difference within subjects. Figure 1 provides a profile plot of the mean scores attained by the control group and the treatment group. As can be seen from the profile plot, the treatment group attained higher scores than the control group on the pretest, posttest, and post posttest. However, the increase in the posttest and post posttest scores of the treatment group are significantly higher than the scores attained by the control group, even when accounting for the difference in the pretest scores.

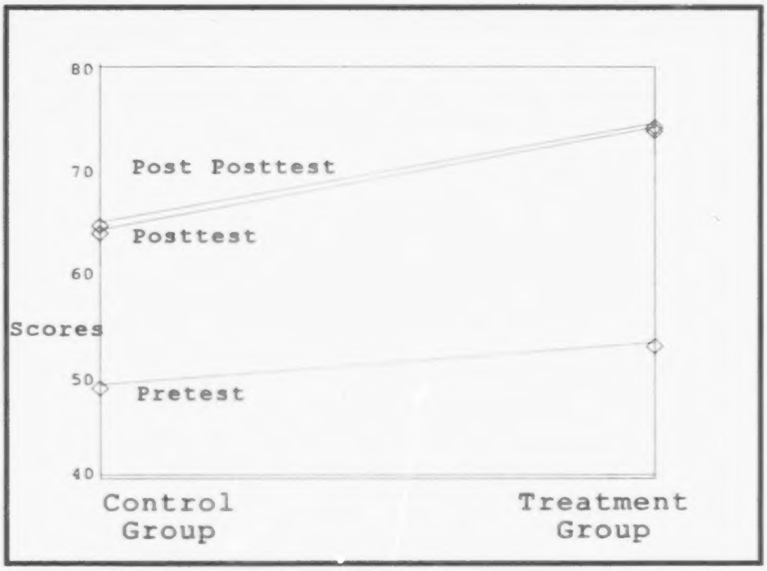

Figure 1. Profile Plot of Estimated Marginal Means for the Pretest, Posttest, and Post Posttest for Control Group (Traditional Classroom Instruction, n=13) and Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996.

Table 4

Repeated Measures Analysis of Variance for the Effects of Instruction Using an Average of the Two Posttest Scores Attained by the Control Group (Traditional Classroom Instruction, n=13) and the Treatment Group (Computer-Based Instruction, n=13), AGED 440, Texas A&M University, Fall 1996

Source	SS	df	MS	F	p	Eta Squared	Observed Power
Between Subjects							
Pretest Scores	1041.64	1	1041.64	14.98	.001	.394	.959
Group	656.75	1	656.75	9.45	.005	.291	.837
Error	1598.93	23	69.52				
Within Subjects							
Time	.471	1	.471	.020	.889	.001	.052
Time * Pretest Scores	.135	1	.135	.006	.941	.000	.051
Time * Group	8.9E-03	1	8.9E-03	.000	.985	.000	.050
Error	544.510	23	23.674				

Group = Type of Instruction

Objective 6 was to determine the perceptions of students concerning the appropriateness of computer programs as educational tools for all students who completed the portion of the instrument relating to perceptions (n=44). Evaluation of t-values revealed that there was no significant difference between the control group and the treatment group. Table 5 presents the mean responses for each of the statements relating to perceptions of computer-based instruction for the entire group of students (n=44). Students disagreed (mean score of 2.57 on the Likert scale) with the statement that computers could be used successfully without the presence of an instructor. The students did, however, express strong support (mean score of 4.11 on the Likert scale) in agreement with using computers as a teaching tool in the classroom. Students also expressed support (mean score of 4.14 on the Likert scale) that computers could enhance learning, but they disagreed (mean score of 2.02 and 2.00 on the Likert scale, respectively) with the idea that computers could provide more effective feedback than traditional classroom instruction or that computer-based instruction was just as interactive as traditional classroom instruction.

Table 5

Means for Perceptions Related to Computer-Based Instruction for the Entire Group of Students (n = 44), AGED 440, Texas A&M University, Fall 1996

Statement	Mean[a]
Computer-based instruction is a good method to use for learning at home.	3.50
Computer-based instruction in a good method to use for learning in the classroom	3.25
If given the choice, I would select computer-based instruction over traditional classroom lectures.	2.27
If given the opportunity, I would choose to take my classes away from campus.	1.86
Computer-based instruction is just as interactive as classroom instruction.	2.00
Computer-based instruction provides more effective feedback than traditional classroom instruction.	2.02
I believe computer-based instruction can be used successfully without the presence of an instructor for college classes when appropriate.	2.57
I believe computers can enhance learning.	4.14
I enjoy using the computer to learn about new topics.	3.80
Learning with computers is more comfortable than traditional classroom instruction.	2.20
I believe computers can be used as a teaching tool in the classroom for appropriate college classes.	4.11

[a] A value approaching 5 indicates agreement with the statement;
A value approaching 1 indicates disagreement with the statement.

Evaluation of the student responses to statements relating to the students' perceptions of technology revealed also that there was no significant difference between the control group and the treatment group. Table 6 presents the mean responses for each of the statements relating to technology for the entire group of students (n=44). Students expressed strong agreement (mean score of 4.39 and 4.52 on the Likert scale, respectively) that they use technology such as the world wide web and electronic mail. They also expressed strong agreement (mean score of 4.73 on the Likert scale) with the idea of using a computer instead of a typewriter for writing papers.

Based on the responses collected, students preferred a variety of instructional methods. When asked which instructional method the students preferred, over 50% of the students responded that they would prefer a combination of traditional classroom instruction and "stand alone" computer-based instruction while 20.5% of the students preferred traditional classroom instruction and 22.7% of the students preferred computer-based instruction in a lab setting with an instructor present. Only 2.3% of the students preferred computer-based instruction at home.

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Table 6

Means for Perceptions Related to Technology for the Control Group and the Treatment Group Combined, AGED 440, Texas A&M University, Fall 1996

Statement	N	Mean[a]
I have used the WWW (World Wide Web) to locate information.	44	4.39
I have sent and received messages by electronic mail (e-mail).	44	4.52
I have taken classes requiring me to get information using a computer link.	44	4.59
I prefer to use a typewriter rather than a computer when writing papers. [b]	44	4.73
Computer technology is advancing at a rapid rate.	43	4.81
Computer usage will be an integral part of my future job.	44	3.98
I enjoy working with computers.	43	3.70

[a] A value approaching 5 indicates agreement with the statement;
A value approaching 1 indicates disagreement with the statement.

[b] Statement was recoded to indicate 5 as favorable and 1 as unfavorable. Thus, a score of 5 indicates disagreement and 1 indicates agreement. Agreement is unfavorable.

A review of analysis of variance findings related to Objective 7 revealed that no relationship existed between demographic characteristics, international exposure, or computer experience and the cross-cultural knowledge level of students in either the control group or the treatment group. This finding lends further support to the previous finding that exposure to the cross-cultural module increased the students' cross-cultural knowledge.

Conclusions, Implications, and Recommendations

The conclusions of this study are based on the major findings from the data collected and analyzed. Based on the cross-cultural knowledge scores obtained through pretesting, it was concluded that there was a need to teach cross-cultural concepts to agricultural students. Based on the scores obtained from the posttest, it was concluded that both classroom instruction and computer-based instruction were effective in increasing the cross-cultural knowledge level of the students. As revealed through the analysis of variance, it was concluded that computer-based instruction was a more effective means of delivering cross-cultural education than traditional classroom instruction to the population.

Based on the finding that the control group's and the treatment group's perceptions regarding computer-based instruction did not differ significantly, it was concluded that exposure to computer-based instruction did not influence the students' perceptions as to the appropriateness of computer programs as educational tools. It was also concluded that students supported the use of computers as an educational tool so long as the instructor is involved in the instruction. In essence, the students responded, "We like computer-based instruction --- but don't take away our instructor!"

The finding that no significant difference existed between students within the control group and students within the treatment group based on demographic characteristics (gender and age), international exposure, or computer experience supports the conclusion that the effect of instruction is independent of the characteristics of the population. The null hypothesis was rejected stating that "no significant difference would exist between the knowledge level of students exposed to a cross-cultural educational module via traditional classroom instruction and those exposed to a cross-cultural educational module via computer-based instruction."

Based on the conclusions previously stated, certain implications emerge. If college-level students in general have the level of cross-cultural knowledge and international experience as exhibited by the students in this study, an implication exists that agricultural students in college need cross-cultural training. Because this exists, the following question also could be raised, "Is there a need for cross-cultural training for non-college individuals engaged in agriculture?"

It was shown in this study that both traditional classroom instruction and computer-based instruction were effective in providing cross-cultural training, and it is known that traditional classroom instruction can be and is used effectively in educational programs. However, traditional classroom instruction does not address the

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need to provide "just-in-time training" (e. g., students taking advantage of a last minute opportunity to participate in a study abroad tour) or "just-in-place training," (e. g., students requiring training in different locations). Thus, the implication exists that computer-based instruction could be effective in meeting "just-in-time" and "just-in-place" needs. In addition, computer-based instruction could be used to teach basic skills necessary to be used in understanding more complex processes. Retention of knowledge is the first level of Bloom's hierarchy of learning (knowledge, comprehension, application, analysis, synthesis, and evaluation) (Bloom, 1956). Computer-based instruction could be used as a preparation stage for traditional classroom instruction to assist the students to enter classroom discussion at a more advanced level so that time spent in the classroom could be used in facilitating comprehension and application, instead of serving as a time to present information.

Because students expressed support for computer-based instruction with the presence of an instructor, an implication exists that if instructors do not develop user-friendly programs, the students may not use the programs as expected and thus may not reflect the same level of effectiveness as demonstrated in this study. Care should be taken to ensure that students know where they can obtain assistance. In addition, because the researcher had no prior training on the use of Authorware® and because it was possible to develop useable and effective material in a reasonable amount of time (three months), an implication exists that other instructors can use computer-authoring programs such as Authorware® to develop effective materials.

Based on the findings of this study, it is recommended that cross-cultural education be provided to students enrolled in college programs of study using computer-based instruction and traditional classroom instruction together. Computer-based instruction should be developed in a user-friendly manner with clear, systematic instructions and effort should be made to incorporate additional technologies (e. g., Internet resources, electronic mail) into cross-cultural educational programs.

Considering the small population used for this study, it is recommended that the study be repeated using a larger and more diverse population. Further research should be conducted to determine the exact combination of technologies that are most effective for delivering cross-cultural educational programs. For example, a study should be conducted to determine the effectiveness of combining computer-based instruction with technology that allows person-to-person video conferencing (i.e., CU-SeeMe® technology); this would allow students to interact with cultures different from their own without leaving the classroom. Further research should also be conducted that addresses teaching approaches other than traditional classroom instruction (e. g., simulations, case studies), student learning styles, and other populations such as non-college adults, post-college adults, and high school students involved within the agricultural sector.

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A Comparison of Traditional And Computer-Based Delivery Methods For Cross-cultural Training For Agriculturalists

A Critique

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It was a pleasure to read this manuscript. The writing style was concise, logical and clear. Any reader with a basic knowledge of social science research methods would be able to easily understand this research summary. Well done.

The overall purpose of this study was to compare two instructional methods, traditional classroom instruction and computer-based instruction, to determine the effects on student cognitive achievement (both immediate and delayed) in cross-cultural knowledge. The secondary purposes were to develop baseline information about cross-cultural knowledge prior to instruction, determine student perceptions of computer-based instruction, and to determine if selected student demographic variables were related to cross-cultural knowledge levels. The research succeeded in accomplishing these purposes for the students completing all parts of the study.

The primary threat to the validity of this study is experimental mortality. The population consisted of 68 students enrolled in a specific agricultural education course. However, because of failure to complete one or more components of the study, data from only 26 (38%) students were included in the final analyses. Table 2 indicates that the 26 students were equally divided in the two groups, but no indication is made concerning the number of students originally in each group. Does differential mortality play any role in the results found? What does the fact that 62% of the original population failed to complete all components of the study suggest concerning student interest in this topic? These questions are likely unanswerable, but should at least be considered in interpreting this study.

The authors used a nonequivalent control group design and presented data to indicate that the two groups were not significantly different on a number of demographic, cognitive, and subject specific attributes prior to the study. This is commendable and should be standard practice when reporting the results of this type of research. As a reader, I assume these comparisons are for those 26 students actually completing the study. Is this correct?

Finally, since the topic of the research was cross-cultural knowledge, would it have been beneficial to incorporate an affective measure into the study? How students feel about this topic is quite likely as important as what they know about it. Developing an understanding of the effects of the two types of instruction on student perceptions in this area could have been an important outcome of this study.

Again, I compliment the authors on a clear, concise, well-written paper. It was a pleasure to read. While some questions remain unanswered, this effort does make a valuable contribution to the field of agricultural education.

Predicting Student Achievement in Agriculture Courses Delivered by Videotape

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Introduction

Distance education in various forms has become increasingly effective in providing access to educational opportunities. Brown and Brown (1994) note that during the last decade of this century a shift from an institution-based system of learning to a more open and flexible system will occur. A demand for more open systems of learning in agriculture exists. Miller and Honeyman (1993) discovered that adult learners enrolled in the Iowa State University College of Agriculture off-campus degree program were strongly positive about the program and viewed it as a valid means of meeting educational needs. One student in their study commented, "I am so happy that these programs are being offered as I have no other way at this time to further my education"(p. 90).

Thus far, more emphasis in distance education has been placed on teaching and content as opposed to learners and learning (Wolcott, 1991; Miller & Carr, 1997). What do we know about student success in distance learning courses? Moore and Kearsley (1996) suggested that factors related to student success in distance education had been well studied. Moore et al.'s definition of success was whether students complete programs. Program completion is clearly an important measure of success, but other measures of success including student achievement in specific distance learning environments are also important. Little research has been conducted to determine what factors might be useful in predicting achievement in courses delivered by specific distance education technologies.

Threlkeld and Brozoska (1993) suggested that individual learner differences may be important determiners of how students respond to instruction. Threlkeld et al. described successful adult distant learners as mature, highly motivated, flexible and self-disciplined. They also noted that students with a field-independent learning style were more likely to experience success in distance learning programs. Threlkeld et al. warn us that developing an illusionary typical distant learner is dangerous considering the diversity of persons served. Describing successful distance learners within the context of a specific distance delivery medium, such as videotape, may be more valuable (Moore et al., 1996).

Can distant learners apply strategies that will enhance their likelihood of success in distance learning courses? According to Fellenz (1989), providing instruction in appropriate learning strategies can improve student achievement. This instruction has included such topics as note taking, time management and study skills in addition to metacognitive and memory strategies.

What can we tell agricultural distance learners about strategies for success in videotaped courses? Miller (1995) identified learning strategies that graduates of an off-campus agricultural degree program had found useful in learning from videotape but conceded that more research was needed to determine what strategies were most effective. Miller (1997) investigated learning strategies and their association with cognitive style in agricultural videotaped courses. In this study, Miller discovered that students relied heavily on the videotape to study, studied independently, completed reading assignments, and studied their notes to learn. Miller also found that students were consistent in their approach to learning from videotape and that field-dependent and field-independent students approached the task of learning in videotaped classes in much the same way. While Miller's research helps us to understand how students approach the task of learning in videotaped courses, it offers limited guidance in determining what strategies lead to greater achievement of intended learning outcomes.

There is a paucity of research involving factors related to achievement in agricultural courses taught at a distance. Such research is needed to help professors and advisors in their work with distant learners. Ultimately, this information would sensitize professors to the needs of students and would be useful for students in selecting more effective and efficient learning strategies.

Purpose and Objectives

The purpose of this descriptive study was to predict student academic performance in College of Agriculture videotaped courses. The objectives of the study were as follows:

1. Compare characteristics of learners who earned A's with those who earned grades lower than A in College of Agriculture videotaped courses.
2. Compare learning strategies of students who earned A's with those who earned grades lower than A in College of Agriculture videotaped courses.
3. Determine whether a linear combination of learner characteristic and learning strategy variables could be used to predict whether students earned a grade of A in College of Agriculture videotaped courses.

Procedures

The population consisted of all students seeking a degree and/or advanced formal training in agriculture through videotaped course offerings of a Midwestern land-grant university College of Agriculture. The sample (n=143) consisted of all students who received a grade in one or more of eight agricultural courses delivered through videotape during spring and fall semesters of 1995. Courses in agronomy (3), agricultural systems technology, animal science, animal ecology, sociology, and biochemistry were offered.

A learning strategies for videotaped instruction instrument was developed by the researcher. The instrument sought both quantitative and qualitative data about the learning activities of distant learners. Content and face validity were established by a panel of experts in agricultural education, and the instrument was field tested for suitability with a group of 10 students who had formerly enrolled in videotaped courses through the off-campus program. The instrument required students to record data related to their learning activities over a seven-day period.

The scale for assessing attitudes toward videotaped instruction consisted of 11 Likert-type items with response categories ranging from strongly disagree (1) to strongly agree (5). The instrument was previously developed and validated by Miller and Honeyman (1993). The Cronbach's alpha reliability coefficient for the attitudinal instrument was .86.

The Group Embedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971) was used to determine the preferred cognitive style of the distant learners. The GEFT is a standardized instrument with a reliability estimate of .82. Also, concurrent validity with the Embedded Figures test was .82 for males and .63 for females. Higher scores on the GEFT are associated with the field-independent cognitive style while lower scores are associated with the field-dependent cognitive style.

Identical data collection procedures were used for both spring and fall semesters. Learning strategies and attitude toward videotaped instruction data were collected by mailed questionnaire. One complete follow-up of non-respondents was completed by mail five weeks after the initial mailing. A total of 117 (81.8%) students completed the learning strategies and attitude toward videotaped instruction instruments. The GEFT was administered by proctors during a regularly scheduled examination. A letter was sent to all students included in the sample (n=143) approximately one week before the GEFT was administered to explain the purpose of the study and to encourage their participation. Ninety-two (64.3%) students completed the GEFT. Student grades were obtained from official university records.

All data were analyzed with the SPSS personal computer program. Appropriate statistics for description (frequencies, percentages, means, standard deviations) were used. Stepwise discriminant analysis was used to determine whether a linear combination of learner characteristic and learning strategy variables could be used to predict whether students earned a grade of A in College of Agriculture videotaped courses. Due to the early stages of this line of inquiry, a significance level of .10 was used as the variable selection criteria for the discriminant analysis. Dummy coding was used to facilitate the inclusion of nominal scaled variables in the discriminant analysis.

Results

Student grades in eight College of Agriculture videotaped courses ranged from A to F. A majority (52.4%) of students earned an A while an additional 9.1% of students earned an A-. The distribution of student grades was strongly skewed in a positive direction (Table 1). For purposes of comparison, students were placed in one of two grade groups. One group included students who earned a grade of A, the other was made up of students who earned grades lower than A.

Table 2 compares the demographics of students who earned grades of A with those of students who earned grades lower than A. Students who earned A's were more likely to be older, male, employed in agriculture related occupations, and possess a more positive attitude toward videotaped instruction. In addition, students who earned A's had taken more videotaped courses and scored higher on the GEFT.

Table 1. Student grades in videotaped courses

Grade	f	%	cum. %
A	75	52.4	52.4
A-	13	9.1	61.5
B+	15	10.5	72.0
B	14	9.8	81.8
B-	12	8.4	90.2
C+	5	3.5	93.7
C	5	3.5	97.2
C-	1	.7	97.9
D+	1	.7	98.6
F	2	1.4	100.0
	143	100.0	

Table 3 compares learning strategies for students who earned grades of A and grades less than A. Regarding tape usage, students who earned a grade of A were more likely to view the tape as received, view the tape in segments, take notes, view the tape more than once, and pause the tape while viewing. As for study methods, students who earned A's were more likely to read assigned readings, view the videotaped lesson, and use "other" study methods. Students who earned A's, on average, spent more time viewing the videotaped lessons, spent a smaller proportion of their time studying with others, spent less total time studying, and called the instructor more frequently.

Due to missing data on the discriminating variables, only sixty-four cases were used in the step-wise discriminant analysis procedure. The procedure yielded a set of five discriminating variables from the 21 learner characteristic and learning strategy variables included in the study. The mean discriminant score (centroid) for students who earned a grade of A was significantly different from the mean discriminant score for students who earned a grade less than A (Wilks' Lambda = .59, Chi-square (5 df) = 31.32, $p < .10$). Further evidence of the discriminating power of the discriminant function is provided. The eigenvalue was .69 and the canonical correlation was .64 (Table 4).

The most distinguishing characteristics of students who earned A's in videotaped courses when compared with students earning grades less than A can be determined by examining the standardized discriminant function coefficients (Table 4). Results show that students who earned A's spent less total time studying, spent more time viewing the videotape, scored higher on the GEFT, were more likely to use study methods other than those identified on the questionnaire, and were more likely to view the videotapes as they were received.

The discriminant function resulted in an overall correct classification rate of 74.1% (Table 5). Students who earned A's were correctly classified 84.0% of the time while students who earned grades less than A were correctly classified 63.2% of the time. Random assignment of students to grade groups would result in correct classification 50% of the time. Classification of students using the five discriminating variables resulted in 48.3% fewer errors than would be expected from random classification (tau = .48). To classify all students, a mean substitution was used for missing data.

Table 2. Comparison of learner characteristics for students who earned grades of A and grades less than A.

	Grade of A		Grade less than A	
Learning Characteristics	f	%	f	%
Gender				
Male	63	84.0	47	70.1
Female	12	16.0	20	29.9
Occupation				
Farming	22	33.3	16	25.8
Agribusiness	19	28.8	16	25.8
Agricultural Extension	3	4.5	1	1.6
Agricultural Education	5	7.6	4	6.5
Other	17	25.7	25	40.3

	Grade of A			Grade less than A		
	Mean	SD	n	Mean	SD	n
Age	35.92	7.77	72	33.74	9.34	65
GEFT Score	13.98	3.41	51	10.51	4.90	41
Attitude toward videotape instruction	3.88	.29	60	3.74	.33	57
Number of videotaped courses taken	3.08	3.47	59	2.65	3.10	55

Table 3. Comparison of learning strategies for students who earned grades of A and grades less than A

	Grade of A		Grade less than A	
Learning Strategies	f	%	f	%
Tape Utilization				
Viewing schedule				
View as received	6	10.0	1	1.8
View at preset time	16	26.7	19	33.3
As schedule permits	38	63.3	37	64.9
Viewed tape in segments	27	45.0	24	42.1
Took notes	55	93.2	47	82.5
Viewed tape more than once	27	45.0	24	42.1
Pause the tape	58	96.7	48	84.2
Study Methods				
Read class notes	39	65.0	40	70.2
Read assigned reading	47	78.3	44	77.2
Viewed videotaped lessons	60	100.0	53	93.0
Studied with one other person	4	6.7	5	8.8
Studied with a group	3	5.0	3	5.3
Used "other" study methods	8	13.3	2	3.5

	Grade of A			Grade less than A		
	Mean	SD	n	Mean	SD	n
Tape viewing time[a]	136.08	40.34	60	118.42	45.38	57
Percent of time spent studying with others	2.28	8.04	60	3.77	11.39	57
Total study time[a]	266.33	211.19	60	298.09	171.57	55
Number of calls to the instructor	.28	.58	60	.19	.48	57

[a] Time in minutes

Table 4. Summary data from the discriminant analysis procedure

Variables	b	s	Group	Centroids
Total study time	-.91	-.45	Grade of A	.72
Tape viewing time	.84	.19	Grade less than A	-.93
Learning style	.61	.44		
Used "other" study methods	.41	.21		
Viewed tapes as received	.36	.21		

Eigenvalue	R_c	Wilks' Lambda	p
.69	.64	.59	<.10

Note. b = Standardized discriminant function coefficient; s = Within - groups structure coefficient; R_c = Canonical correlation coefficient

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Table 5. Classification of cases

		Predicted Group	
Actual Group	Number of Cases	Grade of A	Grade less than A
Grade of A	75	63 84.0%	12 16.0%
Grade less than A	68	25 36.8%	43 63.2%

Percent of cases correctly classified: 74.13%

Conclusions and Recommendations

The error in predicting student achievement in agriculture courses delivered by videotape can be significantly reduced by considering four learning strategy variables and one learner characteristic variable. Students who earned higher grades in videotaped courses spent less total time studying, spent more time viewing the videotape, were more likely to use study methods other than those identified on the questionnaire, were more likely to view the videotapes as they were received, and were more field-independent. Professors and academic advisors should use this information in advising students of how best to approach the learning task in videotaped courses.

Surprisingly, students who spent less total time studying were more likely to earn an A in their videotaped course. What a student does with their study time may be more important than the total amount of time spent studying. Students who spent more of their study time viewing the videotaped lessons were more likely to get A's. Perhaps instructors present key information in their videotaped lectures and evaluate students on how well they understand this information on exams. Students should be advised to use the videotapes as a primary study tool in videotaped courses. Miller (1995) concluded that graduates of an off-campus agricultural degree program had learned to view tapes in segments, pause the tape to think or take notes, and to view the tape more than once to reinforce learning. Students who earned A's in this study were more likely to use these strategies than students who earned grades less than A.

Students who used learning strategies not identified in the questionnaire were more likely to earn an A. Therefore it was concluded that students with a larger repertoire of learning strategies were more successful in videotaped courses. Professors and advisors should encourage students to use a variety of approaches for learning from videotape. Various learning strategies should be identified and shared with students, but professors and advisors should not promote the idea that there is a generalized list of good strategies for all occasions. Prescriptive "how-to" advice lacks sensitivity to individual differences in learners (Taylor, 1984).

Students who viewed the videotapes as they were received were more likely to earn A's than students who put off viewing the tape until a predetermined time or viewed them as their schedule would allow. This is the distance education equivalent of going to class. Advisors should encourage students to view their tapes as they are received (go to class). Research has shown that students who submit their first assignment on time are more likely to complete a distance education course successfully (Moore et al., 1996). Professors may be able to encourage students to engage themselves early in the course by requiring students to complete assignments that require them to view the videotape. Students should be required to complete the assignments within a specific period of time. Such assignments should begin early in the course. This imposition of structure onto a learning environment noted for learner independence and self-direction may be especially helpful to field-dependent learners who were significantly less likely to earn an A. Professors should not assume that all adults are equally capable of self-directed learning (Joughin, 1991).

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Predicting Student Achievement in Agriculture Courses Delivered by Videotape

A Critique

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The researcher is to be commended for his continued commitment to the development of a better understanding of distance education in agriculture, with special emphasis on the characteristics of distant learners. This is an important area and it is good to see an agricultural educator at the forefront of this research area.

The purpose of the research reported in this paper was to determine differences in characteristics and learning strategies between students earning or not earning A's in graduate-level agriculture courses delivered by videotaped instruction. The results of this study are intended to help professors and students improve the teaching and learning process in such courses. Such an intent implies a need to generalize the findings from this study to future groups.

In order to achieve the objectives of the research, students were placed into one of two (artificially) dichotomous groups: those earning an A and those earning less than an A (including an A-minus) in videotaped courses. While the distribution of grades presented in Table 1 likely was the determining factor in defining the two groups, this grouping does suggest several questions. What is the *actual* difference in the amount of learning between a student earning an A and a student earning an A-minus? Do they really belong in different achievement groups? Would you expect the 13 students earning an A-minus to be more similar to the 75 students earning an A, or to the 14 students earning a C-plus or less? Is it not logical to expect that the criteria used to specify group membership will in turn affect the results when characteristics of these groups are examined? How could this effect the results of this study? Does it offer any explanation for the difference in the percentage of correct classifications for the two grade groups (84.0% vs. 63.2%)?

Since the population included "all students who received a grade in *one or more* [italics added] of eight agricultural courses delivered through videotape during spring and fall semesters of 1995," is it possible that specific students could simultaneously belong to both groups? If some students were classified both ways (and no assurance is provided that this did not occur) how would this affect theresults, given that the most basic characteristic of measurement is the mutual exclusiveness of categories?

Overall, students could be correctly classified 74.1% of the time, based on a knowledge of five discriminating variables. This percentage of correct classification was a significant improvement over both random and proportional assignment. Thus, knowledge may be advanced. However, can this be generalized to other groups given (a) the non-random selection and (b) the extremely low ratio (approximately 3:1)of subjects to variables?

Overall, the researcher is to be commended for programmatic research into an important topic. The results of this study provide a solid basis for sustained inquiry.

Teaching Evaluation Skills Using Experiential Learning

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Introduction/Theoretical Base

Experiential education is the process that links education, work, and personal development. As education has become more accessible to all people there has been a corresponding need for educational methods that translate the abstract ideas of academia into the concrete practical realities of people's lives (Kolb, 1984). Kolb proposed that experiential learning theory is a holistic integrative perspective on learning that combines experience, perception, cognition, and behavior.

Experiential education is not a new movement in the field of education. There are numerous scholars who have proposed learning models with the characteristics of experiential learning. John Dewey is considered to be the most influential educational theorist of the twentieth century (Kolb, 1984). As early as 1938, Dewey believed that "there is an intimate and necessary relation between the processes of actual experience and education" (Dewey, 1938, pps. 19-20). Dewey believed that textbook problems most often were not real problems to students and that school learning should be an experientially active, not passive affair (cited by Kolb, 1984). Dewey supported learning experiences in which learners are directly in touch with the realities being studied, rather than simply reading about, hearing about, or talking about these realities. When experiential learning techniques are used as contributors to the creation of a learning environment that maximizes learners' skills in learning from their own experience, the full potential for learning can be realized (Kolb & Lewis, 1986).

There has been tremendous growth in the movement towards experiential education in the 1970-1990's. This growth has been validated by numerous reports and national studies which have called for education which more closely links cognitive learning and skills needed for employment (Kraft, 1986). The school-to work transition movement offers real hope for three-fourths of all students, those who will never earn a four-year college degree (Stone, 1994).

Kolb (1984) described three characteristics of experiential learning. First, learning is best conceived as a process whereby concepts are derived from and modified by experience, not in terms of outcomes. Next, learning is a continuous process grounded in experience. Third, the process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world.

Joplin (1981) defined an experiential education activity as one where a real life, work-based experience was followed by an opportunity for a structured reflection on the experience. It is this structured reflection that helps a learner understand the implications of the activity and how it can be applied to more general situations.

Dewey developed his "experiential theory of education" based on the scientific method of inquiry (Adams & Reynolds, 1986). The scientific method of inquiry is the basis of the problem-solving approach to instruction used in secondary agriculture departments in Missouri.

Experiential learning activities can be developed in many situations. One situation in agricultural programs involves the teaching of livestock evaluation or judging skills. Judging implements the experiential learning process and concept of "do, apply, reflect". The student experiences the judging situation, reflects on the information available, processes that information, generalizes concepts previously learned to the situation, and finally makes a decision by applying concepts learned.

Bruner (1966) outlined three major modes of learning: the enactive (direct experience), the iconic (pictorial experience), and symbolic (highly abstract experience). The enactive or direct learning is comparable to the pupil actually judging horses. The iconic can be related to the learning of horse judging through the use of slides, videos, and pictures. Dale's (1969) "Cone of Experience" described a visual analogy to show the progression of learning experiences from direct first-hand participation to pictorial representation to purely abstract, symbolic expression. Gagne (1977) illustrated the levels of complexity in intellectual skills. In order to solve problems the learner must have rules and defined principles that are based on concrete concepts. In order to learn concrete concepts, the learner must be able to discriminate.

The teaching method is a critical aspect of the learning situation. Dale's (1969) Cone of Experience is based on the degree of abstraction in each teaching technique. The degree of abstraction has to do with the amount of immediate sensory participation involved. The more sensory participation involved, the more enjoyable the learning experience (Dale, 1969). In teaching horse judging skills to youth, there would be more sensory participation involved when using live animals; however, high quality video tapes could provide substantial participation on the part of the learner.

Gibbons & Hopkins (1986) contended that there was such a wide range of different programs referred to as experiential that the term lacks meaning. In order to clarify experience based education they created a scale of experientiality. The scale developed by Gibbons & Hopkins translates the aspects of experiential learning into five modes, with each mode representing a major increase in the fullness of experience involved. According to their scale, the experiential learning activities utilized in this study were in the lower two levels of experientiality. The classroom teaching technique utilized a simulated experience with participants learning from slides, pictures, and videos. The live animal teaching technique involved both a spectator experience and an exploratory experience.

While it is possible to classify experiential education activities using either Dale's Cone of Experience or Gibbons & Hopkins scale of experientiality, it is difficult to verify that experiential education actually has the impact expected. There is little hard evidence about the impact of experiential education programs on participants (Hedin, 1980). Hedin stated:

> Little effort has been made to test systematically the assumptions underlying the recommendations or to investigate empirically which specific forms of experiential programs may be the most effective in realizing the hypothesized benefits.(p.3)

More recent literature is filled with testimonials, journals, case studies, and other data indicating the positive impact of experiential programs on participants; however, there have been very few experimental or even quasi-experimental research studies that have examined outcomes (Kraft, 1986).

There is considerable evidence in the literature as to the value of experiential education and the use of judging activities to develop the life skills of critical thinking and decision making. There is also evidence as to the efficacy of using audio visual and other simulation techniques in educational situations. However, there appears to be a need to investigate the effectiveness of using classroom teaching techniques such as video tapes, slide sets, and printed matter when teaching horse evaluation skills as opposed to the use of live animal comparisons. This study focused on skills in horse judging acquired by participants involved in two different learning environments. Both learning environments were experiential; however, different teaching techniques were used to present the concepts.

Purpose of the Study

The primary purpose of the study was to compare two experiential teaching methods on learning outcomes of 8-18 year old students. A secondary purpose of the study was to examine outcomes for two age groups of participants. The learning outcomes evaluated included skills in evaluating and placing conformation and performance classes of horses.

The study was organized to address the following research questions (related null hypotheses were developed):

1. Will participants in the classroom teaching setting achieve the same level of skill in evaluating conformation of horses as the participants who learn using live animals as measured by placing scores achieved in a contest situation?

2. Will participants in different age groups achieve the same level of skill in the evaluation of confirmation and performance classes of horses?

3. Is there a positive relationship between previous horse judging experience and previous livestock judging experience and achievement of evaluation skills when judging horses?

Methods/Procedures Used

A quasi-experimental design was selected for this study. Cook & Campbell (1979) described quasi-experimental in the following manner.

> Quasi-experiments are experiments that have treatments, outcome measures, and experimental units, but do not use random assignment to create the comparisons from which treatment caused change is inferred. Instead, the comparisons depend on non-equivalent groups that differ from each other in many ways other than the presence of a treatment whose effects are being tested. The task confronting persons who try to interpret the results from quasi-experiments is basically one of separating the effects of the treatment from those due to the initial non-comparability between the average units in each treatment group; only the effects of treatment are of research interest. (Cook & Campbell, 1979, p.6)

The population for this study was secondary agriculture and/or 4-H students aged 8-18 from central Missouri who were involved in the study of judging horses. The participants of the study formed a purposive sample. A purposive sample is characterized by the use of judgment and a deliberate effort to obtain representative samples by including presumably typical areas or groups in the sample (Kerlinger, 1973, p. 129). The participants included 98 students aged 8-18 who participated in a workshop on horse judging in February, 1994. Participants were assigned to treatment groups in the order that their registration was received, alternating between classroom and live animal teaching groups. For purposes of analysis, participants were divided into two age groups. The younger group included participants aged 8 to 11 and the older group included participants aged 12 to 18.

The experimental treatment involved the use of two different experiential teaching techniques to teach established concepts. The lesson plan for both workshop teaching techniques contained the same concepts and the same length of time spent on each topic. The lesson plan included concepts on judging conformation and performance classes and preparation and presentation of oral reasons. The first treatment group learned through the use of live animals and viewed demonstrations of the concepts presented using live animal comparisons. The second treatment group received classroom instruction through the use of charts, photographs, video tapes, and slides. While care was taken to make the basic instruction the same, the instruction was provided in two different environments by two different instructors. Both presented possible limitations as it was cold in the area of live animal instruction and, while well qualified, the instructors had different types of teaching experience.

The quasi-experimental study used a two-factor deign with a repeated measure on one factor (time). The independent variables were teaching technique and age. The dependent variable was conformation scores. The repeated measure was the pre-test-post-test scores on conformation.

Outcome measures were assessed using the placing scores of participants in a contest situation. The contest was run according to National Horse Judging Team Coaches Association guidelines (1990, pps. 11-24). The placing scores were tabulated on a scale of 1-50, with 50 being a placing that matched the official judge exactly. "Cuts" were assigned by the official judge. Cuts were deducted for a placing different than the official and were based on the severity of the discrepancy as outlined in the Official Handbook of the National Horse Judges Team Coaches Association (1990, pps. 18-19). Data about previous judging experience were self reported by years during which students had been learning about judging other livestock or judging horses.

An analysis of variance procedure was used to test the hypotheses with the alpha level set at .05. The general linear model procedure was used to adjust for unequal cell size. The factorial design was used to simultaneously determine the independent and interactive effects on the dependent variable (Christensen, 1985). The extraneous variables of previous judging experience were correlated with the dependent variable using the Pearson Correlation estimate.

Findings

Data for the study were collected under contest conditions at two workshops on horse judging. The students ranged in age from 8 to 18 years of age. As shown in Table 1, the majority of participants in both groups were ages 12-18.

Table 1
Number of Participants by Age and Group

	Conformation
Classroom	
8-11 year olds	17
12-18 year olds	34
Live animal	
8-11 year olds	19
12-18 year olds	28

The first two null hypotheses were developed to determine if there was a significant difference in the pre-test and post-test scores of participants by age and between two teaching techniques: classroom and live animals on the skills associated with judging conformation classes.

The hypothesis was stated as follows:

HO_1: There is no significant difference between pre-test and post-test scores of participants who learned using classroom teaching techniques and scores of participants who learned using live animal teaching techniques on the variable conformation score.

The ANOVA procedure, as reported in Table 2, produced a F value of 6.56 ($p>.01$) which was significant. Therefore, the hypothesis was rejected. There was a significant difference in the post-test minus pre-test score for conformation between the groups. Examination of least square means in Table 3 shows that the amount of change in score of participants in the classroom teaching group were significantly higher than for participants in the live animal teaching group.

Table 2
ANOVAs for Conformation

Variable	df	ss	ms	f	p>f
Teaching technique	1	760.25	760.24	6.56	.01
Age	1	694.42	694.91	5.99	.01
Teaching technique x age	1	56.60	56.60	.49	.49
Error	94	10897.97	115.94		

Table 3
Least Square Means Pre-Post-Test Scores for Conformation

Variable	Least Sq. Mean	Std. Error
Technique		
Classroom	14.20	1.61
Live Animals	8.41	1.59
Age		
8-11	8.54	1.61
12-18	14.07	1.59

HO_2: There is no significant difference between pre-test and post-test scores of participants when grouped by age (8-11 years old and 12-18 years old) on conformation scores.

The ANOVA as reported in Table 2 produced a F value of 5.99 (p .01). The null was rejected. There was a significant difference between the increase in scores for age groups. Examination of the least square means in Table 3 shows that the 12-18 year olds scored significantly higher than the 8-11 year olds (14.07 vs. 8.54). As reported in Table 2, there was not significant interaction between age and teaching technique.

HO_3: There is not a significant correlation between previous horse judging experience and conformation scores.

As reported in Table 4, the Pearson Correlation estimate yielded a r = .14 which was not significant at the .05 level. The null hypothesis was not rejected. There was not a significant relationship between previous experience and the post test scores.

Table 4
Correlations Between Judging Scores and Conformation Scores

Variable	Horse Judging	Livestock Judging
Conformation	0.14	0.08

HO_4: There is not a significant correlation between previous livestock judging experience and conformation scores.

As reported in Table 4, the Pearson Correlation estimate yielded a r = .08 which was not significant. The null hypothesis was not rejected. There was not a significant relationship between previous livestock judging experience and conformation scores.

Conclusions

Based on the findings of this study and contingent upon the limitations, the following conclusions were drawn.

1. Students can learn conformation judging skills equally well, if not better, through the use of audio-visual aids including video tapes and slides as opposed to the use of live animals.

2. Older students learn skills associated with judging conformation more quickly than do students age 11 and under.

3. Previous experience judging horses and/or livestock does not effect learning the skills associated with judging conformation classes.

Implications

Students in the classroom teaching group learned more about judging conformation than students in the live animal teaching group. The possible influence of extraneous variables should be recognized. While both groups were taught according to an established lesson plan which outlined specific concepts to be taught, the instructor with the classroom group was a trained educator and the instructor with the live animal group was a professional judge with no formal preparation in education. In addition, the live animal instruction took place in an unheated barn during February.

However, the difference could be explained by the nature of the subject matter. Selection criteria for judging conformation is very specific, the criteria are prioritized and the criteria are concrete; therefore, the structure offered by the classroom teaching could benefit learning. During live animal evaluation there are many more distractions which divert the judges attention from evaluating and prioritizing specific criteria. By using audio-visual aids the instructor can illustrate desired principles without distractions.

Horse judging skills can be successfully taught using audio visual aids such as video tapes and slides. The horse judging team coach can use audio visual aids to teach judging concepts without transporting the students and making arrangements for horses to practice on. This can save significant time and money. While students can effectively learn judging skills through the use of audio visual techniques, there could be a lowered motivation to learn if this was the only teaching technique used.

While it was expected, the analysis confirmed that older students had higher scores than younger students on performance classes. However, there was not a significant interaction between teaching technique and age. This was an expected outcome as the level of instruction was judged to be more appropriate for the older participants.

The lack of a significant correlation between previous experience judging horses and/or livestock was somewhat unexpected. Logically, previous experience should result in greater accomplishment. This relationship should be investigated in other studies.

Overall, the findings of this study suggest that the efficacy of audio visual techniques in teaching horse judging skills should warrant the development of more and better videos and slides which can be used in teaching judging skills. Development of these teaching materials could be more cost effective than transporting students to judge live horses.

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Teaching Evaluation Skills Using Experiential Learning

A Critique

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The authors are to be commended on developing an excellent theoretical framework, which culminated in a logically derived problem statement. Their discussion of experiential education was both interesting and informative. A more in-depth description of Gibbons and Hopkins' five modes of experiential education would have been helpful.

The authors clearly state that a quasi-experimental design was used in this study. However, they do not explain why a true experimental design was not used. On the surface, it appears possible to have randomly assigned workshop participants to either the classroom or live animal evaluation treatment groups. Since random assignment would have allowed for the testing of causal relationships, the reader would like to know what factor(s) prohibited this from happening.

The paper is not clear in describing when, where and how data on the "outcome measures" were collected. The workshop participants completed a pre-test judging experience prior to the workshop and a post-test judging experience upon completion of the workshop. However, it is unclear whether the pre-test occurred immediately following the workshop or at some later date. This information is essential to interpreting both the context and results of the study, especially since pre- to post-test difference scores were used as the dependent variable for the first two null hypotheses.

The magnitude of the difference score for the classroom and live animal groups is of both statistical and practical significance. If method of instruction is actually responsible for this difference, and if this difference can be generalized to other situations, something of importance has been learned. Unfortunately, we do not know if either of these conditions has been satisfied. Both the method of selection and design preclude our knowing. However, this study does suggest promising areas of future research.

The difference between the pre- to post-test scores for the two age groups was statistically significant, with the older students scoring higher than the younger students. Such a result was expected and is of little importance to professional practice. The finding of no significant interaction effect between method and age group could have practical importance if the results of this study can be verified in future experimental studies.

Overall the researchers are to be complimented on a most interesting study. The results raise several questions that can only be answered experimental research. Hopefully, the authors will pursue this line of inquiry.

Alternate Papers

A Comparison of the Rankings of Selected Agribusiness Standards by Utah Agriscience Educators and Agribusiness and Industry Representatives
Richard M. Joerger, Utah State University
Randall J. Andreason, Iowa State University

An Evaluation of AEE 3202-Introduction to Technical Writing in Agricommunication Web Site and Students Attitudes Toward Using the World Wide Web for Instructional Purposes
Gena E. Roberts, Mississippi State University
Michael E. Newman, Mississippi State University

Factors Influencing the Retention of Senior 4-H Members in Rural Tennessee: A Focus Group Study
Stephen E. Cole, University of Tennessee
Randol G. Waters, University of Tennessee

Influences on Adolescent Job Choice: Implications for Career Awareness in Agricultural Education
Carol A. Conroy, Cornell University
Dennis C. Scanlon, Pennsylvania State University
Kathleen D. Kelsey, Cornell University

Safety Procedures, Education and Standards in Selected Oklahoma Agricultural Education Programs
Doug Ullrich, Jr., Sam Houston State University

A Comparison of the Rankings of Selected Agribusiness Standards by Utah Agriscience Educators and Agribusiness and Industry Representatives

Richard M. Joerger
Utah State University

Randall J. Andreasen
Iowa State University

INTRODUCTION

Before and since passage of the Vocational Education Act of 1963, many secondary and post secondary agricultural education programs have emphasized contemporary agribusiness management education. The 1963 legislation helped pave the way for a more intense focus on agribusiness education as it related to high school curriculum. Current data indicate there is good reason to continue the efforts (The National Council for Agricultural Education, 1996). According to data provided in the 1994 Statistical Abstract of the United States (U.S. Dept. Of Commerce, 1994), the agribusiness community contributes $950 billion dollars to the United States economy. Employment opportunities will continue to be available as agribusinesses continue to grow and expand (Cramer & Jensen, 1985). Nearly 21% of the domestic workforce is employed in the agribusiness sector of the economy (Ubadigbo and Gamon, 1988). However, to maintain a vibrant and properly prepared agricultural work force, agricultural educators and agribusiness and industry representatives need to collaboratively examine and prioritize current occupational competencies that are needed for entry into agribusinesses and industries.

Demands for updating agribusiness education programming have existed for years. Because of changes in the agricultural industry through the use of programmatic research, advisory committees, and partnering arrangements the development of curriculum and the identification of agribusiness educational standards have taken on a new importance. Hunsicker (1977) stated, " The demand for vocational education in agri-business, including agriculture, off-farm agri-business and renewable natural resources will increase rapidly as employment opportunities in this field are recognized." (p.103). The authors of Understanding Agriculture: New Directions for Agriculture (NRC, 1988) stated that agriculture is too important a topic to only be taught to those pursuing careers in agriculture. The authors recommended that:

> New curriculum components must be developed and made available to teachers addressing the science basic to agriculture, food, and, natural resources; agribusiness; marketing; management; international economics; financial accounting; and tools to improve the efficiency of agricultural productivity. (p.35).

The National Summit on Agricultural Education (1989) stated, "Change is rampant in agriculture and agricultural education must keep pace or become an obsolete remnant of the past. It is essential that bold, innovative thinking be encouraged and revitalized to prevent stagnation and rejection." (p.1).

The employment of students in vocational programs has long been one goal of educators. The National Agricultural Occupations Study (1978) was initiated to:

> identify essential agricultural competencies needed for entry employment and advancement in the major agriculture and agribusiness occupations and to validate the importance of the competencies identified for each occupation by workers employed in the occupation. (p.iii).

Numerous studies using panels of industry and education experts to validate agribusiness skills and competencies have found that educators and agribusiness representatives differ in what competencies students should master at the secondary level (Thomsen, 1977; Wood, 1978; Bigo, 1979; Summers, 1979; Israelsen, 1980). Spotanski and Foster (1989) compared rankings of forty-one agribusiness skills as perceived by agriculture instructors and agribusiness managers. Of the forty-one skills, thirty-six were rated to be significantly different when comparing the perceptions of importance between the agricultural instructors and agribusiness managers. Contrary to the earlier findings, Andreasen (1996) found that agricultural business and industry representatives and agricultural educators did agree on the preferred order for teaching selected agribusiness instructional objectives to secondary agriscience students.

Advisory committee participants along with agricultural business and industry representatives, are often used to develop, update and validate competency lists that are subsequently used for instruction (Phipps and Osborne, 1988). This common practice was highlighted by Iverson (1992). He stated:

From its inception, agricultural education has been a community-oriented program. Early leaders extolled the values of living in the community and participating actively in the locality. In addition, teachers were admonished to work closely with parents, local leaders, and businessmen, and to listen to their counsel (p.17).

Secondary agriculture students need to be trained to enter a job market which requires newer and more technical skills. While it is true that there are fewer jobs in production agriculture (Ubadigbo & Gamon, 1988), it is also true that more jobs exist now in agriculturally related fields than ever before, many of these new jobs being in the agribusiness sector (Cramer & Jensen, 1985). Partnering between industry and education has been strongly encouraged by political and education leaders. For example, Bush called for partnering in his Education 2000 initiative. Leaders of agricultural education (The Council, 1992; 1996) and the FFA (Iverson, 1992) also formalized a call for collaboration between agricultural education and agricultural business and industry.

In response to demands to integrate more agribusiness management education into secondary agricultural education programs, curriculum development specialists and researchers identified and investigated the use of many agribusiness competencies. The Utah secondary agriscience and technology program has responded to this challenge and has set out to determine the perceptions of both teachers and agribusiness industry professional regarding the teaching of selected agribusiness educational standards.

PURPOSE AND OBJECTIVES

Drawing upon the expertise of the same agriscience and technology educators and agribusiness representatives used in the Andreasen (1996) study, this investigation sought to identify core agribusiness education standards for use in the Utah Agriscience and Technology programs. The objectives that guided this study were to:

1. describe the opinions of the Utah agriscience educators regarding the level and order of importance for teaching selected agribusiness education standards;

2. describe the opinions of agribusiness and industry representatives regarding the level and order of importance for teaching selected agribusiness education standards; and

3. compare the rankings of the Utah agribusiness representatives and agriscience and technology educators of the selected agribusiness standards.

METHODOLOGY

This was a descriptive study that used a non-equivalent comparison group. Comparison groups attempt to identify analogous perceptions or analyses of studies. Non-equivalent groups may present ideas or perceptions from different points of views concerning the same study (Ary, Jacobs & Razavieh, 1996). Agriscience and technology teachers and northern Utah agribusiness and industry representatives professionals from a wide range of agricultural areas were used as the two non-equivalent comparison groups.

A purposive sample of fifteen Utah secondary agricultural science instructors and thirteen agribusiness industry leaders was chosen to validate standards and objectives of agribusiness competencies. Agricultural education instructors were selectively chosen for this study based on their years of teaching experience and the inclusion of agribusiness competencies in their course of instruction. Representatives from a variety of agribusiness and industry settings participated in the study. They represented farm implement dealers, feed stores, agricultural cooperatives, food processing plants, adult education programs, and agricultural service industries. Thirteen instructors and twelve agribusiness representatives returned usable questionnaires for a return rate of 86.7% and 92.3%, respectively. Because of the purposive selection of the sample, the non-respondents were not sampled.

The one page, duplexed instrument included a list of the 16 agribusiness standards identified from a comprehensive curriculum search. Participants responded to their belief about the importance of teaching each agribusiness standard in secondary agriscience programs in Utah by circling the number of a corresponding response from a seven point Likert-type scale. The scores on the Likert-type scale started with a *7* for Strongly Disagree, *6* Moderately Disagree, *5* Somewhat Disagree, *4* Undecided, *3* for Somewhat Agree, *2* for Moderately Agree, and ended with a *1* for Strongly Agree .

Data collection was completed via the mail through careful adherence to the Dillman Total Design Method (1978). Participants received a postcard in advance of receiving the instrument and accompanying cover letter. Participants received two follow-up letters and instruments at two weeks and four weeks after the initial mailing.

Descriptive statistics were calculated for the agribusiness and industry representatives and agriscience educators responses using the Excel© spreadsheet. The Mann-Whitney analysis using Minitab© analysis software was used to compare the rankings generated from the mean scores of the agriscience educators and agribusiness and industry representatives. The alpha level was established at .05 a priori.

FINDINGS

Drawing upon the expertise of the same agriscience and technology educators and agribusiness representatives used in the Andreasen (1996) study, this study sought to identify core agribusiness education standards for use in the Utah Agriscience and Technology programs. The mean scores and subsequent rankings for each agribusiness management education standard are presented for agriscience educators and agribusiness and industry representatives in Table 1. The data in column 2 indicate the mean scores of the agriscience teachers of the sixteen standards ranged from 1.62 (SD=0.92) to 4.23 (SD=1.58). The agriscience educators moderately (2.51-3.50) or somewhat agreed (1.51-2.50) that 12 standards should be taught in the Utah agriscience curriculum. They were standard numbers 1,2,3,4,5,6,8,9,10,11,14, and 16.

The initial standard the agriscience and technology teachers indicated should be taught was that students should "demonstrate written and verbal communication skills". They further indicated they were undecided if the remaining standards (7, 12, 13, and 15) should be taught. They indicated the least important standard to be taught in Utah was "use approved estate planning practices and principles for the agribusiness".

The data in column 3 of Table 1 indicate the mean scores of the agribusiness and industry representatives ranged from 1.75 (SD=0.95) to 3.67 (SD=1.31). The agribusiness and industry representatives moderately or somewhat agreed that 12 standards should be taught in the Utah agriscience curriculum. They were standard numbers 1, 2, 3, 4, 6, 7, 8, 9, 10, 12, 14, and 16. The agribusiness and industry participants indicated the first standard to be taught should be to "use of computer technologies in agricultural business and management". They further indicated they were undecided if the remaining standards (11, 13, and 15) should be taught. They indicated the least important standard to be taught in Utah was number 13, "monitor the affects of non-government organizations and government on the operation of the agribusiness ".

The data in Table 1 indicate the agriscience educators and agribusiness representatives moderately or somewhat agreed on 11 of the same agribusiness standards that should be taught in Utah agriscience departments. They where standard numbers 1, 2, 3, 4, 5, 6, 8, 9, 10, 14, and 16. The agribusiness educators indicated standard number 11 was a part of their top twelve, while the data from the agribusiness representatives indicated standard numbers 7 and 12 were within their top twelve. Both groups agreed that standard 13 (monitor the affects of non-government organizations and government on the operations of the agribusiness) and standard 15 (use approved estate planning practices and principles for the agribusiness) were the least important standards to be agreed that standard 13 (monitor the affects of non-government organizations and government on the operations of the agribusiness) and standard 15 (use approved estate planning practices and principles for the agribusiness) were the least important standards to be taught in the secondary agriscience and technology programs in Utah.

Table 1 Utah Agriscience Teachers and Agribusiness and Industry Representatives Rankings of Selected Agribusiness Management Education Standards

	Agribusiness Standard Description	Agribusiness Educator (n=13)		Agribusiness Representatives (n=12)	
		Rank[1]	Mean S.D.	Rank	Mean S.D.
1.	Demonstrate written and verbal communication skills	1	1.62 0.92	2	2.08 1.11
2	Apply basic economic principles in agricultural business and management	5	2.38 1.27	3	2.17 1.07
3.	Apply general agricultural business and management principles	3	2.15 1.10	4	2.25 1.16
4.	Maintain agribusiness records using approved procedures and practices	4	2.31 1.59	5	2.42 1.11
5.	Apply agribusiness sales and merchandising skills	11	3.23 1.05	13	3.50 1.50
6.	Exercise agribusiness marketing skills	8	2.92 0.83	8	3.00 1.35
7.	Practice agribusiness management and quality control	13	3.54 1.39	10	3.25 1.01
8.	Use computer technologies in agricultural business and management	2	1.92 .92	1	1.75 0.60
9.	Implement approved agribusiness finance and credit practices	7	2.69 1.26	7	2.58 0.95
10.	Apply approved tax management strategies	9	3.08 1.14	12	3.33 1.18
11.	Utilize approved insurance and risk management strategies and practices	12	3.38 1.33	14	3.58 1.32
12.	Maintain an awareness of the influence of agricultural laws on the operation of the agribusiness	14	3.85 1.41	9	3.08 0.95
13.	Monitor the affects of non-government organizations and government on the operation of the agribusiness	15	3.92 1.27	16	3.67 1.31
14.	Implement appropriate personnel management practices in the agribusiness firm	10	3.08 1.44	10	3.25 1.48
15.	Use approved estate planning practices and principles for the agribusiness	16	4.23 1.58	14	3.58 1.55
16.	Maintain approved safety and health practices in the agribusiness	6	2.46	6	2.50 1.76

[1] Note: 7=strongly disagree, 6=moderately disagree, 5=somewhat disagree, 4=undecided, 3=somewhat agree, 2=moderately agree, 1=strongly agree

A Mann-Whitney analysis using Minitab© analysis software was subsequently completed to compare the rankings of the Utah agribusiness representatives and Utah agriscience and technology educators. A Mann-Whitney analysis procedure was used to determine if the median values of the two populations (agriscience educators and agribusiness and industry representatives) were equal (Hinkle, Wiersna & Jurs, 1994). The Mann-Whitney analysis indicated the test of ETA1 (agriscience educators)= ETA2 (agribusiness and industry representatives) vs. ETA1 ≠ ETA2 was significant at 0.95. The rankings of the two groups were, indeed, statistically equal.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the analysis and interpretation of the data, several conclusions and recommendations are offered for further consideration. First of all, the agriscience and technology educators moderately or somewhat agreed that 11 selected agribusiness standards should be taught. However, they did not strongly agree or disagree, in any magnitude, with the teaching of the selected standards. The educators believed the most important standard to be taught while teaching agribusiness education was to "demonstrate written and verbal communication skills". The educators concurred with the agribusiness representatives that it was of least importance to teach secondary students how to "monitor the affects of non-government organizations and government on the operations of the agribusiness" and "use approved estate planning practices and principles for the agribusiness". Secondly, the agribusiness representatives moderately or somewhat agreed that 12 selected agribusiness standards should be taught. They indicated the initial standard to be taught should be the "use of computer technologies in agricultural business and management". Contrary to the the agriscience educators, the agribusiness representatives were undecided if secondary students should be taught how to "utilize approved insurance and risk management strategies and practices". And finally, although the study did not demonstrate a strong agreement by either groups with the teaching of any of the sixteen agribusiness standards, it did indicate the groups were in agreement concerning which agribusiness standards ought to be taught in Utah agriscience and technology programs. This finding differs with the level of agreement reported by other researchers (Foster and Spotanski, 1989; Thomsen, 1977; Wood, 1978; Bigo, 1979; Summers, 1979; and Israelsen, 1980).

Even though this study found agreement in what agribusines standards should be taught, current evidence remains inconclusive. Therefore, agriscience educators and agribusiness representatives must continue to cooperate in determining appropriate secondary level agribusiness standards and objectives. Furthermore, alliances need to be strengthened through innovative partnering activities that periodically bring agribusiness representatives into agriscience classrooms and agriscience educators into agribusiness environments. Though not currently supported in the literature, on-going consensus in the teaching of selected standards may be further developed with timely and on-going interactions between agriscience educators and agribusiness representatives. Concurrent with these practices and activities, researchers need to conduct similar studies with different designs and populations of agriscience educators and agribusiness representatives. It remains unclear how and why agriscience educators and agribusiness and industry representatives often share differing views about appropriate secondary agribusiness standards and objectives. Answers to these questions are needed to ensure the development and teaching of appropriate agribusiness standards and objectives.

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An Evaluation of Aee 3203 - Introduction to Technical Writing in Agricommunication Web Site and Students Attitudes Toward Using the World Wide Web for Instructional Purposes

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Introduction and Theoretical Framework

Martin (1995) noted that as students change, then so must the courses which schools offer. Computer and communications technologies can be used in innovative ways to enable course material to adapt to meet these changes.

The World Wide Web (WWW) works by associating nodes to each other, similar to an endless spider web (Wei He & Knapp, 1995). The established description of the WWW is a "wide-area hypermedia information retrieval initiative, aiming to give universal access to a large universe of documents". Thus, the WWW provides a consistent means of accessing a variety of media in a simplified fashion for computer users with network capabilities (Hughes, 1993).

World Wide Web instructional material improves students computer skills, information processing abilities, availability of lecture material and offers links to related material offered at other web sites (Newman, Raven & Day, 1996).

Dyrli (1995) stated that the web "has the potential to change the nature of teaching and learning significantly" (p.51). Many educators have been attracted to the multitude of resources on the web (Hertzberg, 1995) and the benefits and opportunities for using the WWW seem limitless. But, the greatest application of the WWW may be for undergraduate and graduate level classes (Terry & Briers, 1996).

Usefulness for Classroom Instruction

Terry and Briers (1996) conducted a case analysis of a web site for an agricultural education course, Agricultural Education 440, Methods of Technological Change. They identified demographics and computer competency, determined how the students used the course web site, students perceptions toward the web site, barriers to usage of the course web site and relationships of these characteristics. Results revealed that students visits to the web site averaged once per week, and one-half of the students printed presentation graphics and course readings from the web site.

Overall, Terry and Briers (1996) recommended that as course web sites become common, evaluations will be necessary to determine if the findings from their study resulted from the "novelty" of the WWW, or if the web's instructional usefulness extends beyond its novelty.

Course Description

AEE 3203 - Introduction to Technical Writing in Agricommunication is a required course for students in various disciplines. It is a three credit hour course offering basic principles and techniques of communicating information relevant to agriculture/agribusiness, natural resources and home economics.

The course is also considered a type of "web based instruction (WBI)" referred to as "web supported." Parsons (1997) defines "web supported" as courses that have physical meetings of students and teachers, but offer many resources on the WWW. AEE 3203 was one of the first at Mississippi State University to utilize the WWW heavily. Since the summer of 1995, 28 sections of AEE 3203 have been taught using "web supported" instruction (Matt Raven, personal communication).

The material offered on the WWW for students in AEE 3203 includes; syllabus, individual student pictures with a link to their e-mail account, PowerPoint slides used in classroom lectures, outlines of the slides, score sheets, assignments and links to related material found on the web.

Design Utility

The instructional usefulness of the web is unlimited and new web pages are being added to the World Wide Web at phenomenal rates. Despite the number of guides to writing HyperText Markup Language (HTML), many web sites have usability problems.

According to Lynch (1996) the first steps in designing a web site are to:

- define a set of goals
- identify the target audience
- have a statement of purpose
- know the main objectives
- have a concise outline of the information the site will contain.

Although web documents are easy to create, usability mistakes are often made. Usability problems usually occur with navigation and consistency in screen design and layout. Ultimate consideration should be given to the users, therefore it is imperative to test your web site (Lindgaard, 1994).

Purpose

The purpose of this evaluation was to determine the instructional effectiveness and design utility of AEE 3203 - Introduction to Technical Writing in Agricommunication web site. Additionally, the evaluation sought to gain insight into the possibilities of offering the course through the World Wide Web, excluding the need for classroom instruction. In the divergent phase of the evaluation (Worthen & Sanders, 1987), stakeholders were interviewed and expressed concerns totaling 40 questions. In the convergent phase (Worthen & Sanders, 1987), stakeholders concerns were condensed into three critical questions.

1. How useful do students currently enrolled in AEE 3203 - Introduction to Technical Writing in Agricommunication find the information offered on the AEE 3203 web site?

2. How many of the students currently enrolled in AEE 3203 - Introduction to Technical Writing in Agricommunication feel the course could be adequately taught electronically without classroom instruction?

3. Is the web site for AEE 3203 - Introduction to Technical Writing in Agricommunication adequately designed?

Procedures and Methods

Population and Sample

The population of this evaluation consisted of 214 students enrolled in AEE 3203 - Introduction to Technical Writing for Agricommunication in the spring semester, 1997 . Eight sections of this course were taught that semester, and for reasons of instructional consistency, cost and time, a stratum sample of the population was used.

The sample consisted of 83 students enrolled in Monday, Wednesday and Friday (MWF) classes. Monday and Wednesday classes met for 50 minutes of lecture in a classroom utilizing PowerPoint slides and additional web site links to assist in instruction. Friday class met in the computer lab at Dorman Hall for 50 minutes. The questionnaire was given to the three sections, Friday, April 25, 1997, with class attendance totaling 48 students for that day or 58 % of the target population.

Instrumentation

The instrument used to collect the quantitative data was developed by the evaluator. In addition to the cover letter explaining the purpose of the evaluation, the questionnaire contained questions with items rated on a Likert scale (1=strongly disagree, 2=somewhat disagree, 2.5=undecided, 3=somewhat agree, and 4=strongly agree) and demographics. The questionnaire was reviewed by faculty of the Department of Agricultural Education and Experimental Statistics and graduate students in AEE 8703 - Evaluation of Agricultural and Extension Education Programs to obtain content validity.

Statistical Analysis

Data collected were transcribed to SPSS 7.5 (Statistical Package for Social Sciences) and analyzed using descriptive statistics (i.e. means, medians, standard deviations, frequencies and percentages).

Results and Discussion

Demographics revealed that sixty percent of the participants were seniors with 17 different majors from the College of Agriculture and Life Sciences, College of Engineering and the College of Forest Resources. Sixty-seven percent had a computer at home and 48% had access to the Internet from home.

Critical Question 1: How useful do students currently enrolled in AEE 3203 Introduction to Technical Writing in Agricommunications find the information offered on the AEE 3203 web site?

The questionnaire contained a Likert scale with seven items designed to answer critical question #1. Descriptive statistics revealed an overall mean of 3.22 (SD=.4041) for critical question #1 indicating overall student satisfaction of the usefulness of web pages for AEE 3203 - Introduction to Technical Writing in Agricommunication.

Questions concerning accessability and specific instructional media used were also included in the questionnaire. Results are summarized below with somewhat agree and strongly agree categorized together.

Access and Navigation

- Ninety-eight percent found course information easy to locate on the AEE 3203 web pages with 93 % indicating they enjoy accessing course material from the World Wide Web.
- Ninety-one percent indicated that the information on the AEE 3203 WWW pages helped their writing skills
- Eighty-three percent of the participants had no problems printing out course material.
- Seventy-nine percent indicated they had no trouble finding a computer to access course information, they felt secure using PDF files and that the information found on the AEE 3203 web pages replaced the need for a textbook.
- Forty-five percent responded they never used the textbook.

PowerPoint Slides

- Seventy-nine percent encountered no problems accessing the PowerPoint slides outside the classroom and helpful when studying for exams.
- Seventy-five percent felt the PowerPoint slides made lectures more interesting.
- Thirty-one percent felt the PowerPoint slides contained boring material with 33% indicating the content was too elementary.

Content Outlines

- Sixty-six percent felt the outlines were easily accessible.
- Eight-one percent felt they were useful in studying for exams with 83% indicating no problems with printing.
- Seventy-nine percent preferred the outlines on the web over taking notes in class.
- Fifty-two percent agreed that more detailed information was needed on the outlines.

Conclusions

Overall, the students enrolled in AEE 3203 - Introduction to Technical Writing in Agricommunication in the spring of 1997, felt the web pages helped their understanding of course material, improved their writing skills and was easily accessible. Along with the confirming positive results of usefulness of AEE 3203 web site, there are a few other points to consider. Some students felt the material was boring and elementary. These results seems reasonable due to the variety of majors the course serves and their previous experience. Also, the majority of the participants felt that the web site replaced the need for a textbook.

Recommendations

Due to the positive response of the students to the web site used for teaching AEE 3203 - Introduction to Technical Writing in Agricommunication, only minor alterations are needed to improve its usefulness. Students know the information is on the web and do not take notes in class. Consequently, they depend on the outlines to offer comprehensive information when preparing for exams. Therefore, as the results from the survey supported, students need more detailed information on the outlines. In addition to more detailed information, instructors may consider upgrading the information on the PowerPoint slides and outlines to a slightly higher level of difficulty.

Critical Question 2: How many of the students currently enrolled in AEE 3203 - Introduction to Technical Writing in Agricommunication feel the course could be adequately taught electronically without classroom instruction?

The questionnaire contained a Likert scale with four items to assist in answering critical question #2. Descriptive statistics on data collected from questions revealed an overall mean of 3.75 (SD=.5223).

Students prior computer knowledge could effect their opinions about the web site, therefore, several other questions were included in the survey relating to critical question #2. Ninety-eight percent had used a word processor, 30% had used presentation graphics, and 30% had used a form of file transfer protocol.
An important component of courses taught strictly on-line is the continuation of student/instructor communication. Questions concerning e-mail revealed interesting findings. Seventy-three percent had used e-mail and 88% strongly agreed that was easy to use and a good way to communicate with the professor. Fifty percent strongly agreed that using e-mail was less intimidating than asking questions in class.

Conclusions

Overall, the students enrolled in AEE - 3203 had adequate computer skills to successfully take this course off the web without classroom instruction. Also, most of the participants felt they would take this course strictly through the World Wide Web if some additional course information was provided.

Due to the number of students present for the survey, there is some concern regarding attendance. This may correspond to the fact that students feel they do not need to attend class because of accessability to course information on the WWW.

Recommendations

Although students supported the idea of taking the course off the WWW without classroom instruction, variation in opinions exists. Some students indicated they could have completed the course without classroom instruction but would not like taking the course without traditional lectures. Others, were very definite in there opinions and ability to take the course without classroom instruction. Therefore, AEE 3203 - Introduction to Technical Writing in Agricommunication could be taught using both instructional techniques and accomplish the goals of providing best learning environment for individual students.

Although there were mixed opinions about attending lectures, some students indicated that they can get all the information needed from the WWW. One of the original objectives of creating the AEE 3203 web site was to allow more class time for writing exercises (Matt Raven, personal communication). If these interactive activities were rigorously utilized, perhaps students would feel they were obtaining information and skills in class that they could not get from the WWW. Since there are seven different instructors, collaborative efforts should be made to recognize these problem areas and begin to implement solutions.

Critical Question #3: Is the AEE 3203 - Introduction to Technical Writing in Agricommunication web site adequately designed?

The evaluator observed design standards and suggestions offered at various web sites. The philosophy of web site design is discussed by Lynch (1996) and includes identifying the target audiences, including a statement of purpose, identifying the main objective and having a concise outline of the information the site contains. The following check list (Comber, 1995) was also helpful is determining the AEE 3203 web site design utility. The checks indicate that the AEE 3203 web site adequately meet those criteria.

Content
✓Short title.
✓Meaningful headings.
✓Sign and date pages.
✓Short documents (around 2 screens).
✓Provide a printable version of lengthy documents.
✗Each page should "stand alone".
Visual Appearance
✓Provide text alternatives to images using **ALT**.
✓Specify the size of images with **WIDTH** and **HEIGHT**.
✗Use thumbnails instead of large graphics.
✗A logically designed ISMAP (image map) is better than separate buttons.
✗If blinking is necessary, blink a character such as * rather than text.
✓Use logical formatting.
✓Aim for consistency of design.
Navigation
✗Provide links on each page to other relevant pages.
✓Re-use icons where possible.
✓Tell the user how big and what type of files that are offered for download.
✓Avoid meaningless links.

Testing
✓Checks links on a regular basis.
✓Test the usability of your web system.
✗Make sure that services offered work correctly.
✗Check log files to gauge user acceptance of your system.

The evaluator also located standards for common design elements for every page used by the state of North Carolina. The AEE 3203 - Introduction to Technical Writing web site meets all necessary criteria outlined here but one. The meta tags. They provide information for WWW search engines and indexers. The meta tags are not required but are highly recommended (http://www.dhr.state.nc.us/DHR/docs/webstnd/webdes18.htm).

Conclusions

Overall, the web site for AEE 3203 Introduction to Technical Writing in Agricommunications is adequately designed. Only a few minor adjustments are necessary in order to meet all of the items listed on the checklist.

Recommendations

AEE 3203 - Introduction to Technical Writing in Agricommunication web site should include a wordmark on every related page and provide links on each page to other relevant pages. A system of checking the web site for graphic download time and other services offered should be routinely used to ensure they work correctly from other commonly used computer labs across campus. The web site includes counters, and should be set up to gauge and record student use of the pages. The usage of large graphics are considered in designing the web pages and at the present do not present a problem. The checklist recommends using ISMAP and is for suggestive purposes only. A meta tag should be provided to portray a higher degree of professionalism.

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Factors Influencing the Retention of Senior 4-H Members in Rural Tennessee: A Focus Gr[illegible] Study

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Introduction and Theoretical Framework

The passage of the Smith-Lever Act officially created the Cooperative Extension Service (CES), an organization dedicated to meeting peoples' educational needs in agriculture, home economics and related areas. The youth development program of the CES, 4-H, is the largest youth organization in the world. The 1994 4-H enrollment report stated that over five and a half million youth worldwide were involved in some type of 4-H activity (USDA, 1995). The 1994 Tennessee 4-H enrollment report indicated that nearly 186[illegible]rticipated in a 4-H activity [illegible]r program (Tennes[illegible]ion Service, 1995). [illegible]hough the 4-H[illegible]h youth aged nine to [illegible]en, a maj[illegible]d nine to 12. Once [illegible]nter th[illegible]a decline in 4-H [illegible]ent. T[illegible]indicated that [illegible]perc[illegible]r older [illegible]199[illegible]III [illegible]dic[illegible]e [illegible]an[illegible]as [illegible]see,[illegible]fied [illegible]of[illegible] [illegible]s, has [illegible]over" [illegible]f teenage [illegible]g out? [illegible] with other youth [illegible]lment and [illegible]re not [illegible]work, [illegible]we [illegible]h[illegible]dd[illegible]y [illegible]p[illegible]ag[illegible]era[illegible]les[illegible]nti[illegible]all[illegible]ogra[illegible]r ex[illegible]that [illegible]ral y[illegible]e m[illegible]am. This [illegible]lso te[illegible]e th[illegible]ver 70 percent of the t[illegible]I mem[illegible]ural or farm setting.[illegible]

[illegible] and Bo[illegible]that parents involved[illegible]organizatio[illegible]ad a positive influence on their c[illegible]decision to remain an active 4-H member. Also the study [illegible] the higher parental income and educational level the m[illegible]he 4-H member would remain active. Caplinger (1984) noted that sibling involvement had a positive influence with retention of 4-H members. Hartley (1983) found parental support and encouragement to influence re-enrollment.

Incentives, projects and competition is another area which has received much attention from researchers concerned with 4-H retention. Forbes stated "Perhaps one type of individual finds greater satisfaction in the incentive structure offered in 4-H, while others seek a different type of challenge (1992, p.37). While

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exploring 4-H projects, Norland and Bennett (1993) noted there was a very low relationship between 4-H member satisfaction and the number and types of projects taken. A recent survey in Tennessee found that 4-H agents feel awards and recognition possibilities are some of the strengths of the 4-H program (Meadows, 1995). Although competition is a major part of the 4-H program, many youth have mixed feelings toward this aspect of the program. A study conducted by The Pennsylvania State University (1974) determined many youth had a negative attitude regarding the 4-H emphasis on competition. Smith (1982) found that 4-H members like to compete more than non members.

In addition to these factors, youth interests, perceptions, and other factors have been determined as influences on 4-H retention. Yet the problem of low retention among older youth still exists.

Purpose and Objectives

The purpose of this study was to determine factors which influence the retention of senior 4-H members in Tennessee. The findings of this study were used to determine how senior 4-H (9th-12th grades) retention can be increased. The specific objectives were:

1. Determine the types of activities teens prefer;
2. Determine what teens like/dislike about 4-H;
3. Determine reasons why teens drop out of 4-H;
4. Determine what teens think would increase retention in the Tennessee 4-H program.

Methods and Procedures

Three focus groups were to be conducted in each of the three geographic regions (east, middle, and west) in Tennessee. Because of a logistical conflict, one site was dropped for a total of eight focus groups. Different regions were selected because of the different perceptions teens might have regarding the 4-H program in Tennessee. The study dealt with youths' ideas, opinions, and attitudes. Therefore, focus group research method was selected as the research method of choice. A focus group is a qualitative research method designed "to obtain perceptions on a defined area of interest in a permissive, non-threatening environment" (Krueger, 1994, p.6). Greenbaum stated that "when used appropriately, focus groups can be extremely effective in generating meaningful information about consumer attitudes toward a variety of topics" (1993, p.16). Because of the rural and farm influence on 4-H enrollment (over 70 percent), rural teens no longer active in 4-H were selected to participate in this study. The definition of rural was determined by referring to the 1991 Tennessee Statistical abstract which defined rural as an area with little or no urban influence. Areas considered urban or having urban influence were excluded from the sample. The remaining sites were then selected by random sample. Once these sites were selected, the appropriate Extension agents were contacted and asked to identify at least six to 10 former 4-H members who were enrolled in high school. These individuals were informed of the study by mail. The letter, parental and student consent forms outlined the study and other relevant issues such as consent and confidentially. The instrument used in the study was a researcher developed focus group questioning route. The design was based the on guidelines to conducting focus groups with youth provided by Krueger (1994).

Results and Findings

The purpose of this study was to determine the factors which influence the retention of senior 4-H members in Tennessee. Review of the responses revealed several important factors to consider. When asked, it was determined that teens participate in a variety of activities both inside and outside the school system. Teens identified sports, church, school clubs, and jobs most often. Teens also indicated they were involved with more than one activity. Some specific responses were:

- **School cheerleading and Gymnastics club**
- **Church and the FFA**
- **Basketball, volleyball, track, Just Say No**

When asked about 4-H club activities, teens remembered participating in several activities. Most of the teens remembered participating in club contests (poster, bread baking, etc.), 4-H camp, and judging teams. Teens also revealed their feelings about each activity. For example, teens said:

- **4-H Camp was a blast**
- **Always made a poster about milk (negative tone)**
- **Making bread and working with cows**

The responses to this question helped determine what teens remember about 4-H and to a degree how they felt about these activities. The question also provided a smooth transition into the next set of questions.

When asked which activities they enjoyed in 4-H, students said they enjoyed camp, livestock activities, and getting out of class. Students also enjoyed club activities but to a lesser degree. Many students enjoyed 4-H because it got them out of class. After further probing it was determined that the teens liked getting out of class (beyond obvious reasons) to do different things. Students stated 4-H gave them the opportunity to try different things and to be a part of something new. The teens also enjoyed competition, winning, and the challenges provided by 4-H activities. Students also liked activities because they were fun, informative, different, and gave them a chance to meet other youth. Specific responses were:

- **The survival skills at camp was a challenge**
- **Camp was way cool**
- **It was fun to do different things during school**

When asked what things the teens remembered not liking about 4-H, most teens said they did not like the 4-H club structure and noted that there was a lack of seriousness from other students and teachers concerning the 4-H club. The teens said that the 4-H club was boring, too strict, and that the club structure allowed no time for fun things. Some responses were:

- **We sat in the club and listened to her (agent) talk**
- **(Agent) too strict, wouldn't let you talk**
- **We got books and didn't know what to do with them**

When asked about the perceived lack of seriousness from students and teachers, the teens said:

- **No one ever took 4-H seriously**
- **Other students did not cooperate, they made fun of 4-H**
- **I never baked bread, that's stupid**

Although the students made some comments about 4-H activities, the stronger theme was with the 4-H club and the manner in which club activities were conducted.

After teens determined what things they did not like about 4-H, the next question to explore was "What did you not like about these activities?". Teens revealed several answers to this question. First, they said the rules associated with 4-H activities were too strict and this often limited participation from many 4-H members. The teens also felt officers and other 4-H activities lacked a purpose. Several students asked why 4-H agents changed every year and noted that this was another reason to not like 4-H. Other responses were:

- **They (agents) made us do the activities**
- **Posters always dealt with farm stuff**
- **We wanted to do something, it's our club not theirs**
- **Are agents supposed to change each year?**

The Tennessee 4-H program has a strong association with the school systems. Many 4-H members are involved with 4-H during school hours. With this in mind it was no surprise to learn why 4-H members join. Most students joined 4-H because it is offered as a classroom activity and if you are in the school system you are a 4-H member. This issue of "blanket enrollment" also ties into the students lack of understanding about 4-H activities. Teens said:

- **Everyone joined, we did not have a choice**
- **If you are in the 4th or 5th grade you joined**
- **We did not understand 4-H, we just did it**

These statements also reinforced the negative opinion of students being pressured into participation in 4-H activities. Some students did state there were other reasons to be involved with 4-H; being involved with new activities, participate in livestock shows, and having fun. Other statements related to reasons for enrollment in 4-H were:

- **I wanted to show my horse**
- **I like being around animals**
- **4-H was the first opportunity to do something in school (activity)**

Students joined 4-H for many reasons, but overwhelmingly these students joined because they were enrolled during school.

When the students were asked why some teens decide to not remain active in 4-H the issue of the 4-H image quickly emerged. Teens felt their peers saw 4-H as a childish activity. They also felt 4-H had a bad image with other teens. They added by saying that their friends were busy with other things such as jobs and sports. Other themes were "4-H was not fun" and "there was not enough contact time with agents". Some students thought that 4-H was not offered in high school. Other comments were:

- **4-H is an elementary thing**
- **It's not cool, if your involved you are not cool**
- **The activities are for little kids**
- **If you are in it, you'll be made fun of**

Teens also indicated that 4-H was not offered in their school or they did not know about 4-H in school. Specific responses were:

- **We don't have 4-H in school, I don't think it's offered**
- **I never see our agent in school**
- **I would go to 4-H if it were in school**

The issue of 4-H image was further explored when teens were asked to determine what their friends think about 4-H. This question elicited several positive and negative responses. For example some teens said:

- **They think it's dirty and stupid**
- **It's for nerds and geeks**
- **We don't talk about it (apathetically)**

On the flip side, some students felt their friends had a positive image of 4-H. For example, students said:

- **It (4-H) can help you go to college**
- **4-H can help you get scholarships**
- **My friends have a positive image of 4-H, it was fun**

Although these comments were not as common, it shows that some teens have a positive image of 4-H. However the childish image of 4-H was still a strong theme reinforcing the idea that many teens see 4-H as an activity for a younger audience. Many teens said that they did not have any friends who were still a member of 4-H and only a few were not sure if their friends were still involved. Apparently teens pay close attention to not only their activities but the activities of others.

One of the final questions asked was what is your overall opinion of 4-H. In the previous questions, teens were negative on several issues. Surprisingly, the teens had a very positive image of 4-H. Yet, the issue of 4-H being for younger youth was once again mentioned. Some of the comments made by the teens seemed to be given out of politeness. Examples of responses to this question were:

- **It's okay but it needs too be changed**
- **Good for elementary (kids)**
- **It's okay but it needs to be worked on**
- **It's a nice program, but it needs to be more mature**

When asked, nearly all teens said that 4-H needed to improve the senior program. Probing from this question helped to lead students into the next question.

The final question of the study was one of the most important questions in the entire focus group. Teens were asked what they think should be done to keep more teens involved in the 4-H program. This question is designed to help decision makers in 4-H determine what approaches should be taken from the teens perspective. Very quickly four major themes emerged. First, teens identified marketing as an area where 4-H could make a positive impact on retention. Teens said that:

- **Agents need to tell students about 4-H**
- **Tell them (students) about the programs**
- **Better marketing**

Many of the teens expressed that most of the 4-H activities lacked a purpose, this could be attributed to a lack marketing. Other issues related to marketing were discussed and will be examined later. Another issue was the type of programs offered to teens. Teens felt the 4-H program needed to offer more mature activities which better meet their needs and interests. Examples of this were:

- **Offer more mature activities**
- **Offer programs we want to do**
- **Get more interesting stuff for high school students**

The third issue identified was the issue of time. Many students suggested that 4-H needed to be offered during school. Students said:

- You will not pick 4-H over other things, do it during school
- 4-H can't compete with other activities
- All high school students want to work

For many Extension agents offering in school programs is not an option. Several schools in Tennessee operate off of the block scheduling system and in school programs for 4-H is not an option. Therefore, alternatives to this issue must be explored.

A final issue was the 4-H agents working with the teenage audience. The teens made several comments such as:

-The agent should be more like a friend than a teacher
- We need to be treated like adults not kids
- Agents should remember what it is like to be a teen

Several of the students felt 4-H agents needed to be better trained to work with older youth.

Each of these four issues have implications for the senior 4-H program and should help to improve the program in Tennessee.

Conclusions and Recommendations

Marketing and Image

Teens identified marketing as a major area to address in order to increase retention in the 4-H program. The students noted a lack of purpose in the 4-H program, a lack of contact time with the 4-H agent, and a lack of knowledge concerning 4-H activities and programs. Students also held a strong perception of 4-H programs being designed for younger children. These are all issues related to marketing and image.

Students showed a definite lack of knowledge related to the purpose of the programs and activities offered in 4-H. Students also determined that many of the teens lack an understanding of the activities and programs offered in the 4-H program.

Another marketing related issue is the lack of contact between the teen audience and the 4-H agent. Because 4-H programs are offered in school for younger children many 4-H agents spend time preparing and delivering programs to that audience. Also many agents are not meeting the senior audience in school therefore many of the students do not make a personal contact with the 4-H agent.

Image has been a concern with the 4-H program for many years. In other studies the farm image has been a major theme but that was not the case with this study. A few of the students mentioned the farm image but most identified the image of 4-H being a club for younger children as a concern which needed attention.

Teen Programs

Teens also stated that many of the 4-H programs did not appeal to them. They stated that these programs were too childish and not interesting to older youth. This issue has two areas which should be addressed. First the Tennessee 4-H program needs to address the issue of marketing. As stated earlier, many of the teens did not have a clear understanding of the types of activities and programs offered to the senior audience. This was documented in the last chapter when teens said they wanted to take trips and learn about career opportunities. Apparently the teens did not know that trips and career exploration are two major activities offered to teens in the Tennessee 4-H program. Perhaps the Tennessee 4-H program is offering the things which interest teens and they are not aware of it. If however, it is determined that the teens are not interested in the current 4-H programs then some new programs designed to meet the needs and interests of teens should be implemented. If this is the case, then the marketing of these new programs will once again become an issue.

Time

Most of the teens stated they would be involved in the 4-H program if they had more time. Many said that 4-H should be offered during school hours. The teens said several of the students would come to a 4-H meeting because they could get out of class and the students might decide that they like 4-H once they are there. This is an excellent recommendation except for the problem of having 4-H in school. In Tennessee and several other states high schools utilize the block scheduling system. This is a system which does not allow time for many extracurricular activities such as 4-H. Therefore, if 4-H puts an emphasis on working with teens during school hours, much thought must be placed on how this is to be accomplished.

Agents

The students also discussed the Extension agent as someone who could make an impact on the retention of teens in the 4-H program. Most of the teens had negative perceptions regarding agents. They remembered agents as being controlling in the classroom and not giving the students an opportunity to share their ideas. They also perceived agents as individuals who pressured them to participate in activities they were not interested in doing. Teens said they wanted agents to be more understanding of their concerns. They also wanted someone who could be a friend and a teacher. They felt the agents did not care about working with teens or their opinions. They also thought that agents did not want to take time to work with them.

Recommendations

The purpose of this study was to identify factors which would influence teen retention in the 4-H program. Several factors have been identified with four factors being paramount. The recommendations to increase retention can be even further simplified.

The 4-H agent is the foundation of any county 4-H program. Program success is determined by agent performance and that performance is hopefully enhanced by training received from the county, district, and state level. **Therefore, it is essential that each agent be adequately prepared to work with each audience level (explorer, junior, junior high, and senior). It is apparent that 4-H agents need additional training which will assist them in successfully working with the teen audience. Agents will also need new curriculum materials and new ideas about how to approach this audience.** For reasons previously mentioned, the most difficult audience with which to work is the teen audience. Yet, not all of the recommendations will be directed towards the senior audience.

For example, the teens felt that 4-H lacked a purpose. This issue should be addressed in the early years of a students' 4-H program. **Agents need to provide the students with a clear understanding of the goals and purpose of the 4-H program while they are still active.** If the students see a purpose or worth in the activity they will be more likely to stay actively involved. This too will assist in dealing with the issue of lack of understanding of the types of programs offered in 4-H. It should be noted that the agents themselves might not have a clear understanding of the purpose of these activities. This is why proper training in 4-H programming could be needed. In short, the agent will be required to spend more time communicating purpose and marketing programs to the students. Hopefully, this effort will help develop a better understanding for the 4-H member. Once the students understand the types of programs and activities offered they might decide that 4-H does indeed offer interesting and beneficial programs. If the students determine that these programs do not meet their needs or that the programs seem too immature, then some decisions about new programs should be made. This is apparently the case because most of the teens stated that the 4-H program was seen as a club for younger children. The students stated that they enjoyed being active and doing fun things which did not include sitting quietly and listening to others talk. There was a strong negative perception around the 4-H club. Perhaps this is where the idea of new programs and activities should begin. **In order to successfully conduct programs for an older audience agents will need training in using new and different curriculum materials which should appeal to older youth.** If no new materials exist, then a strong effort should be made to develop new materials. Agents also need to promote a positive caring image and provide the students with an opportunity to express their own ideas. This will also require more training in working with older youth.

The agents need to emphasize the purpose of 4-H and what activities are offered. They also need to consider new programs for older audiences who are not interested in the current programs and market these programs in a manner that is appealing to the teens. These programs need to provide teens with fun activities where interaction with others is encouraged. The agents also need to address the teens in a different manner than younger youth. Students in high school are very different from grade school students.

Because of the difficulty in working with teens during school hours many senior 4-H programs have club meetings after school. This causes a problem with students who participate in other activities. As stated earlier, most students are involved with other activities. Therefore, it is difficult to maintain participation in 4-H and continue with these other activities. Most students felt that 4-H could not compete with other activities and that 4-H needed to be offered during school. Most 4-H agents do not see this as an option. **However, if the agents were to make a greater effort to work in the high schools and develop a collaborative approach with teachers and administrators, this issue could be addressed. Also the Tennessee 4-H program could help foster this effort by developing more ties with the state board of education as well as providing agents with curriculum which would enhance what the students are studying in school.** This could also help with the marketing of the 4-H program. If the teachers and administrators see a worth in the program they too will decide to participate. Agents will again need materials and training if this recommendation is to be successfully implemented.

In summary there are four major issues related to teen retention in the Tennessee 4-H program. If students are to remain active in 4-H they need to have programs that meet their needs and interests. These programs should be designed and marketed in a way that is appealing to their age group. Programs do not have to be offered during school, but the agent needs to make an effort to adequately expose 4-H and the programs to this audience. Also the agents need support from the state level with training and materials that will assist in working with this audience.

With this in mind, the Tennessee 4-H program should:

1. **Develop new programs designed for teens.** A prime example of a new program would be the Sigma Lamda Chi 4-H organization developed by the University of Georgia Cooperative Extension Service. Sigma Lamda Chi 4-H is targeted toward students who are not attracted to a more traditional 4-H program. Yet, the program emphasizes service, leadership, and citizenship as does the more traditional program.
2. **Market these new programs.** Marketing of these new programs should encompass several methods or strategies. First, these programs should emphasize fun activities. Students stated the traditional 4-H program did not allow time for fun activities. By giving senior 4-H members fun social activities thru programs like Sigma Lamda Chi 4-H, the image of the total 4-H program will change. Also these programs need to give 4-H members the opportunity to have ownership in the club. Giving ownership will allow students to feel as though the club or program is actually theirs not the Extension agents. Letting 4-H members decide what activities they want (within the program guidelines) and allowing them to plan and conduct these activities will enable the program to grow and become more acceptable and appealing to senior aged 4-H members.
3. **Foster collaboration with schools.** The Tennessee 4-H program is quite successful in working with and through elementary and middle schools. However, when students enter high school there is little or no opportunity to operate the 4-H program during school hours. This presents a barrier to working with the senior audience but there are some alternatives to consider. Four-H offers many projects and programs which could supplement classroom instruction. In addition, 4-H agents are trained in a variety of disciplines and have the resources to assist senior students in a variety of ways. For example, students in classes such as Economics, Family Life, Biology and Home Economics could benefit from the expertise of an agent. Teachers and agents could work together to develop a more comprehensive educational experience for the seniors. By serving as a guest lecture in the classroom agents could make great progress in promoting the 4-H program. This potential opportunity should begin by agents offering their resources to teachers and informing teachers of the many Extension resources available. This will help promote 4-H and develop future opportunities to promote the 4-H program. In the future, the opportunity for teacher in-service related to 4-H could develop. This would be a prime opportunity to give teachers 4-H materials and programs to use during class. The teachers would then serve as 4-H in class volunteer leaders.
4. **Provide training and support for county 4-H agents.** As stated earlier, before new programs are to be implemented, old programs need to be evaluated. Many 4-H agents work with programs that place a great deal of demand on their time. Adding additional programs might compound this problem and cause agents to face more time management concerns. Once these programs are evaluated, ones which seem to no longer be needed should be discontinued. Also, many agents have little or no training on working with youth. In order to be successful, 4-H agents need to develop a better understanding of their audience. This should be done by offering formal coursework, in-services, and other professional development opportunities.

Recommendations for Further Study

This study has identified issues which need to be addressed in order to increase senior retention in the Tennessee 4-H program. However this study has not answered all of the questions regarding this dilemma. Several other issues related to senior retention should be addressed. Some specific recommendations for further study are:

1) To determine perceptions of teachers and administrators concerning the Senior 4-H audience
2) To determine which current 4-H programs are no longer needed
3) To determine how to restructure the 4-H club
4) To determine what type of training would be most beneficial to 4-H agents

If the 4-H program is to continue as the largest youth organization in the world the current programs and their formats, delivery methods, and marketing techniques must be examined. It is unrealistic to think that all teens will stay involved in the 4-H program but it is feasible to think that a greater percentage of these teens could and will remain active if the programs offered meet their needs and interests, are presented in an appealing way and are presented by someone who understands teens.

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Influences On Adolescent Job Choice: Implications For Career Awareness In Agricultural Education

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Introduction

Historically, agricultural education provided an expanded educational experience. Successful agriculture programs have been characterized as rooted in communities with citizen ownership. They provided an effective approach to life-long learning and commitment to education of the "whole" student through leadership development, recreation, competition, and standards of integrity (NRC, 1988).

This interdisciplinary study, drawing from the fields of agricultural/vocational education, sociology, and demography, identified factors that influence the occupational identity of rural adolescents. It specifically compared students choosing agriculture-related occupations with those selecting other occupations. Understanding factors that influence the occupational career choice of adolescents in the context of community could provide a basis for Tech-Prep and School-To-Work programs in agriculture.

Theoretical Framework

Agriculture and related businesses continue to be a major force in national employment and productivity, but the actual number of individuals employed in production farming has declined dramatically (USDA, 1996). This decline should have led to drastic changes in the foci of secondary programming, but, as reported by The Committee on Agricultural Education in Secondary Schools (1988) in Understanding Agriculture: New Directions for Education the majority of secondary programs continue to emphasize production. This "production emphasis" attracts fewer students into programs, and therefore, recruitment into secondary programs remains an issue.

Influences on Career Choices

Choices made by young people—what courses to take in high school, whether to attend college, what to study once there—affect who they are and what they do (Adelman, 1994). Making the wrong choices, particularly those that limit educational attainment, will reduce an individual's possibilities for job success and/or upward mobility over the course of a lifetime (Topel & Ward, 1992) by limiting the career-line paths which emerge from the initial job placement (Spilerman, 1977). This educational limitation impacts not only the evolution of earnings and status, but also the ability to network, maximize job satisfaction, and exercise voluntary job mobility.

According to Super and Bohn (1970), a child develops ideas about what he/she can do, likes to do, and what others expect him/her to do at a very young age. Harter (1990) stated that an adolescent's sense of self is based upon performance in domains where success is important such as the school environment. Parents' education and occupations are indices of social class (Steinberg, 1989), but evolution of a vocational identity depends upon experiences within the family (Erickson 1963, cited in Herr, 1972). The higher socioeconomic family provides a career frame-of-reference based on values associated with the states of the family (Blau, 1992; Blau & Duncan, 1967). Biblartz and Raftery (1993) found that sons in nonintact families identified with the mother's occupation which is likely to be service or clerical in nature (Conroy, 1996).

Whitehead (1996) studied gender-related attitudes toward career choice in a study conducted in England and Wales. She found that males were more likely to choose sex-stereotyped careers than females, and that males were much more biased in their subject choices toward masculine subjects and supported traditional sex roles for themselves. No such pattern was found for females. "Females therefore are not avoiding masculine subjects to the same degree as males are avoiding feminine ones, nor are they concentrated in subjects thought 'appropriate' for them, again unlike males" (p. 154). Whitehead made an interesting comment that it is not so much that "females are under-represented in mathematics and the physical science, but that males are greatly over-represented" (p. 155) due to males' choices away from feminine subjects. These results supported prior research by Donelan (1992) and others (Lokan & Fleming, 1994).

Orthel, Sorensen, Lierman & Riesenberg, (1989) concluded that an overwhelmingly negative opinion of pursuing an agricultural career is really an expression of pursuing a career in farming and ranching. Students have not been exposed to factual information about the industry of agriculture and corresponding careers (Orthel et al., 1989). There is evidence to show that students' perceptions about agriculture are formed and subsequently influence enrollment decisions at or before the junior high level (Scanlon, Yoder and Hoover, 1989). Today's young adults are strongly influenced by expected economic rewards associated with career alternatives. Society's macro issues, changing lifestyles, and occupational images projected by the mass media have a major impact on career decisions of adolescents. Therefore, food and agriculture information and recruitment issues must deal with these megaforces.

An identification of factors that influence adolescent job choice can be a tool to assist program design in secondary agriculture, Tech-Prep, and School-To-Work Transition initiatives. Understanding these environmental and background factors which help shape how students view themselves in the "world of work" is a key to understanding their motivation for selection of programming options at the secondary level.

Purpose and Objectives of the Study

The purpose of this study was to identify factors that influence occupational identity of rural adolescents, specifically to compare those choosing agriculture occupations to those selecting other occupations. Specific objectives were:

1. determine occupational aspirations of the rural youth participating in the study;
2. develop a demographic profile of the participants;
3. determine which demographic and other factors were related to occupational aspirations of participants choosing agriculture vs. non-agriculture careers.

Methods and Procedures of the Study

The population consisted of 750 students enrolled in grades 7 through 12 in a rural school district that has not had an agriculture program for at least 15 years. Survey instrument data provided information about students' attitudes, beliefs, and thoughts about jobs and careers, their self-esteem, and their perceived levels of family communications. Prior to use the instrument was reviewed by a panel of experts with backgrounds in psychology, rural sociology, and agriculture/vocational education to assure content and face validity. The special education coordinator for the participating school district also determined its appropriateness for use with special needs students. Data analyses reported in this paper are from several sections of the instrument. Due to time constraints the instrument was not pilot-tested. The scales were revised following inter-item reliability calculations and the final data analysis was based on the revised instrument.

Data were collected from a total of 612 students—the total student population less 80 students enrolled in the "Skills Classes" (formerly classified as trainable mentally retarded), three students who refused to participate, and approximately 50 who were absent on the day of the assessment. A total of 531 students provided ideal job choice data which were used to examine influences on occupational choice for students selecting agriculture (N=57, 11%) and those selecting other occupations (N=474, 89%).

Participants responded to 20 Likert-scaled items developed by the authors that represented factors associated with choosing a job and/or career as outlined in the literature on labor mobility. The answers for the items were coded from "1" (Not Important) to "4" (Very Important). A factor analysis identified two underlying constructs in the response patterns to the Likert-scaled items: 1) importance placed on stabilizing home and family environment (α=.72) and 2) knowledge of a job and its opportunities (α=.75). The other variable groupings were: 1) average earned grades, 2) gender, 3) family size, 4) fathers' occupations, 5) fathers' employment status, 6) students' self-esteem (based on Rosenberg, 1965, α=.85), 7) family structure, 8) mothers' education, and 9) family communications focused on three areas identified through a second factor analysis—perceived levels of positive reinforcement from parents (α=.85), encouragement of child autonomy (α=.85), and discussions about jobs and the workplace of the future (α=.75). The family communications section of the instrument was based on research conducted by Flanagan in 1994 (Flanagan, 1995) and consisted of 34 Likert-scaled statements to assess students' perceptions of the frequency of communications with their parents. Since the number of students selecting agriculture and related occupations was only 57, a decision was made to recode the intervally-scaled variables for use in contingency table analyses. An alpha level of .05 was set for all analyses.

Results of the Analyses

Students were nearly equal in regards to their average earned grades whether choosing an agriculture or a non-agriculture career. Participants choosing a non-agriculture career were nearly evenly divided by gender (49% male, 51% female) while more males than females chose an agriculture career (65% vs. 35%) (Table 1). The groups varied by social and economic indicators. More students choosing an agriculture career lived in homes with the father present than did those students choosing a non-agriculture career (86% vs. 75%) (Table 1). The analysis also showed that parents of students selecting an agriculture career were less likely to have a high school education than parents of students selecting a non-agriculture career.

Table 1. Demographic Characteristics of Participants

	Job Choice	
	Agriculture % (N)	Non-Agriculture % (N)
Average Earned Grades	88% (50)	86% (475)
Average or above	12% (7)	14% (65)
Below average		
Gender		
Male	65% (33)	49% (208)
Female	35% (18)	51% (216)
Family Structure		
Father in home	86% (49)	75% (358)
Father absent	14% (8)	25% (117)
Father's employment		
Employed	97% (34)	93% (284)
Unemployed	29% (1)	7% (22)

Students Choosing an Agriculture and Related Career

Nearly one-third of the students stated that their ideal jobs would be working as veterinarians (32.9%), an occupational goal not uncommon for many adolescents. Conroy (1996) found that over 60% of the students in a related study utilizing the same population desired professional occupations, many which require graduate study or special licensing or certification. An additional 12.1% desire careers in other animal science fields. However, 22.4% also stated they wish to pursue production farming, with another 10.4% interested in forestry-related occupations, primarily in logging and sawmill operations (Table 2). An examination of Table 2 reveals that students are interested in science and technical careers in agriculture, many of which will require training beyond the secondary level. These decisions were made without the influence of a secondary agriculture program.

Table 2. Ideal Job Choices of Students Aspiring to Careers in Agriculture

Job Category	N	Percent
Veterinarian	19	32.9%
Production Farming	13	22.4
Other Animal Science	7	12.1
Forestry	6	10.4
Landscaping	5	8.6
Wildlife and Related	4	6.9
Other	4	6.9
TOTAL	58	100.0%

Choosing Agriculture vs. Non-Agriculture Occupations

An examination of Table 3 reveals that there are only two variables with significant relationships to occupational choice—gender and father's occupation. Males were more likely to select an agriculture occupation than females (64.7% vs. 35.3%), although the relationship was not a strong one (ϕ=.097). Students were more likely to select an agriculture occupation if their fathers worked in a labor/service job or in farming, with only 15.6% of their father's involved in professional or other white collar occupations compared to 23.7% for fathers of students selecting non-agriculture jobs (Table 3). This relationship was much stronger (ν=.200) than that based on gender.

Table 3. Contingency Table Analyses Comparing Influences on Agriculture vs. Non-Agriculture Job Choice

	Job Choice				
	Agriculture		Non-Agriculture		Coefficient*
	N	%	N	%	
Activities	57	100.0%	475	100.0%	.082
None	11	19.3	76	16.0	
1-3/month	23	40.4	238	52.2	
4-5/month	16	28.1	116	24.2	
>5/month	7	12.3	35	7.4	
Average Grades	57	100.0%	474	100.0%	.013
Above aver	50	87.7	409	86.3	
Aver/below	7	12.3	65	13.7	
Gender	51	100.0%	424	100.0%	.097**
Male	33	64.7	208	49.1	
Female	18	35.5	216	50.9	
Family Size	57	100.0%	424	100.0%	.058
1-3	12	21.1	117	24.6	
4-6	35	61.4	303	63.8	
>6	10	17.5	55	11.6	
Father's Occ	51	100.0%	396	100.0%	.200**
Prof	4	7.8	38	9.6	
Wh. Collar	4	7.8	56	14.1	
Clerical	0	0	5	1.3	
Skill Trade	19	37.3	177	44..7	
Labor	15	29.4	104	26.3	
Farming	9	17.6	16	4.0	
Father's status	35	100.0%	306	100.0%	.052
Employed	34	97.1	284	92.8	
Unemployed	1	29.0	22	7.2	
Self-Esteem	52	100.0%	467	100.0%	.084
High	30	57.5	232	49.7	
Medium	21	40.4	225	48.2	
Low	1	1.9	10	2.1	
Family Structure	57	100.0%	475	100.0%	.077
Father	49	86.0	358	75.4	
No father	8	14.0	117	24.6	
Mom's educ	53	100.0%	456	100.0%	.084
<HS	7	13.2	59	12.9	
HS	29	54.7	239	52.4	
HS+	12	22.6	77	16.9	
BS	3	5.7	59	12.9	
BS+	0	0	5	1.1	
Grad degree	2	3.8	1.7	3.7	
Importance-home & family	57	100.0%	475	100.0%	.056
High	32	56.1	290	61.1	
Medium	23	40.4	156	32.8	
Low	2	3.5	29	6.1	

*ϕ reported for 2 x 2 table; Cramer's v reported for 2 x R tables

**$p \leq 0.05$

Table 3, continued

	Job Choice				
	Agriculture		Non-Agriculture		Coefficient*
	N	%	N	%	
Importance-job knowledge	57	100.0%	475	100.0%	.088
High	17	29.8	103	21.7	
Medium	35	61.4	286	60.2	
Low	5	8.8	86	18.1	
Positive reinforcement	55	100.0%	475	100.0%	.067
High	20	36.4	197	41.5	
Medium	23	41.8	150	31.6	
Low	12	21.8	128	26.9	
Encourage autonomy	55	100.0%	475	100.0%	.031
High	7	12.7	76	16.0	
Medium	22	40.0	193	40.6	
Low	26	47.3	206	43.4	
Discussions about future job	55	100.0%	475	100.0%	.037
High	3	5.5	41	8.6	
Medium	20	36.4	174	36.6	
Low	32	58.2	26	54.7	

*ϕ reported for 2 x 2 table; Cramer's V reported for 2 x R tables

**$p \leq 0.05$

Conclusions and Recommendations

Agricultural education has been continuously changing and adapting since its inception; this evolution produced several distinct changes not the least of which was the identification of agricultural education with vocational education. This identification produced several negative results. College became more accessible and desirable; students pursuing college educations selected distinctly different high school paths than those who expected to enter the workforce upon graduation. This resulted in science and academic skills being considered as "preparation for college," and not as necessary—or a lower priority for vocational students (Rosenfeld, 1984; Warmbrod, 1962).

Enrollments in secondary agriculture programs peaked during the 1970s. Subsequent school consolidation, increased accessibility of higher education, and several key pieces of federal legislation resulted in declining enrollments with less community ownership and support (Law, 1994). All this is occurring at a time when employment opportunities in the agriculture industry remain high (USDA, 1996).

Eleven percent of the students in this study selected agriculture occupations; these students were similar to the rest of the student body in terms of grades, level of activity participation, and other identified influences on job choice (Conroy, 1996). However, they differed on two very important variables—gender and socioeconomic status.

This study confirmed existing knowledge about the effects of socialization—from socioeconomic status and gender—on adolescent views of "self. Females and lower socioeconomic students were more likely to select an agricultural occupation than males and those of higher socioeconomic status. Since socioeconomic status is positively correlated with achievement (Flanagan, 1993) there is concern that students with less ability are choosing careers in agriculture at a time when technological demands of the industry are increasing.

Socioeconomic status, through the father's occupation, has long been regarded as the key indicator of labor mobility potential for an adolescent (Blau & Duncan, 1967). In one sense occupational choice based on the father's occupation can be regarded as the "default" occupation if alternative information about jobs and careers is not available.

Conroy (1996) found that family communication about future work was a significant predictor of what jobs students expected to hold five years after completion of formal schooling. These findings supported prior research that suggested that family interactions are keys to vocational identity development (Steinberg, 1989; Erikson, 1963, cited in Herr, 1972). To be effective career education programs must not only provide factual information about careers, they must also contribute to the formation of students' occupational identity by challenging stereotypic notions of probable success, notions which result from socialization of gender and socioeconomic status. Individual barriers to accessing and processing information must be identified in an effort to compensate for selectivity of information delivery such as that which results when socialization occurs (Steinberg, 1989; Harter, 1990). Programs that do not do this may not achieve their goals of successfully recruiting students into agriculture.

Implications for Agricultural Education

Many benefits exist for any community—the school or the more broad population—that supports an agriculture program. Current educational reforms that emphasize the integration of academic and vocational subject matter, work experience and apprenticeship, and work readiness provide the perfect venue for agricultural educators to capitalize on their rich experiential and applied learning base. Resulting occupational experiences would positively impact on student perceptions of potential for success in agricultural careers. The fundamental importance of agriculture to our culture, history, and economy, and the increasing awareness of the scientific nature of agricultural technology, make agriculture the premier content vehicle to tie academic disciplines together. Interdisciplinary inquiry such as that conducted as part of this study is necessary if programs and courses are to be designed that meet both industry and students' needs and occupational interests.

In New York State, one rural school district is taking the lead in the development of a K-12 agricultural program which includes: 1) agricultural literacy through graduation, 2) introduction to careers and technology through applied activities in the agricultural sciences, and 3) a Tech-Prep initiative to prepare students for postsecondary study in the food and fiber sciences. The insight of administrators into the benefits of using agricultural content as the "common" thread that weaves through their entire curriculum is a pioneering effort to serve students. At the same time they will be preparing young people for productive futures and meeting the needs of an industry which becomes more diverse and technical over time. A key to the success of this new program will be an agricultural literacy program for parents and their involvement in the planning process—no program can be successful without motivated and capable students and adequate information for them to make the best career decisions.

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Safety Procedures, Education And Standards In Selected Oklahoma Agricultural Education Programs

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Introduction and Theoretical Framework

In today's' legal climate, safety concerns are of utmost importance within our ever changing Agricultural Education Program. With ever tightening educational budgets and changing curriculums, facility maintenance and safety supplies are easily overlooked as a necessary expense. Changes in state requirements for teacher certification have also added to the problem. Overlooking basic precautions can lead to serious consequences. The possibility of legal action is great for those... who teach courses that involve machinery or equipment that, if misused by the student, can cause serious physical injury (Foldesy, 1991).

The increasing level of legislation and policy-making is of particular interest to industrial [and agricultural] educators who deal with such issues as safety and liability (Gathercoal & Stern, 1987). Agricultural education programs require extensive periods of instruction in mechanical laboratories, greenhouses and animal production facilities and involve large amounts of hands-on experiences for students. The possibility of accidents... is considerable because of the nature of the activities which are a normal part of the learning process in these types of programs (Kigin, 1973).

The proper utilization and selection of methods and technologies with which to teach about safety are necessary to improve student retention and learning of each of the necessary skills and attitudes. Laboratory experience can provide experiences which go beyond recall and develop application, analysis, and evaluation skill used in agricultural industry (Shinn, 1988). Lawver (1992) and Swan (1993) contended that in service programs should be planned and conducted on such topics as planning and implementing comprehensive agricultural safety programs. These programs are needed to train agriculture teachers on the proper methods of teaching, monitoring and documenting safety instruction and facility maintenance.

The elements of a safety program -- such as safety policies, manuals, meetings, committees, inspection, investigation of incidents or record keeping analysis of records -- are tools of the trade in most companies (Peterson, 1993). Business and industry are driven through economics and legal issues to seek out safety problems. In an article detailing how to prepare for OSHA inspections Artz (1993) stated that the best defense against safety problems is a good offense. From these examples, Agricultural Education can learn many lessons.

In-depth research into safety standards and problems have been documented in countless texts, journals and magazine articles. The magnitude of safety problems and concerns is found across the country and is illuminated most specifically by the following studies: Bear, 1975; Berkey, 1981 and 1989; Forsythe, 1983; Kigin, 1983; Gleim and Hard, 1988; Lawver, 1992; Schlautman and Silletto, 1992; Swan, 1993; and numerous others. These studies show that, "Agricultural Education safety standards need to follow those standards tested and designed by Business and Industry through the enforcement of the Occupational Safety and Health Act" (Reece, 1980).

Purpose and Objectives

The purpose of this study was to determine and assess safety education practices, safety procedures and identify areas of safety compliance in selected Oklahoma schools as a means of improving safety education and the safety environment of agricultural education programs. The following objectives were formulated to accomplish this purpose:

1. Describe the demographics of selected Agricultural Education teachers and facilities in Oklahoma.
2. Determine the safety policies and procedures utilized in selected agricultural education programs.
3. Determine the extent of compliance with recognized safety standards in agricultural education programs.
4. Identify areas of safety and safety education where in service education and curriculum and facility changes are needed to help agricultural education teachers become more aware of the expected safety practices and procedures.

Methods and/or Procedures

The population of this study consisted of 24 Agricultural Education programs in the Tulsa Professional Improvement Group of the Agricultural Education Division of the Oklahoma Department of Vocational and Technical Education. There were 33 Agriculture teachers associated within the 24 programs. The primary purposes of the Professional Improvement Groups are to provide leadership and to develop program improvement and teacher development programs. This population was selected because the proximity of the area was close to the home base of the researcher and allowed for keeping the cost of evaluation and data collection to a manageable level as data collection required a personal visit to each school. The schools in this group had considerable variety including: single teacher and multi-teacher departments; older and newer school facilities; as well as, horticultural and agricultural production programs.

After conducting a review of the literature including studies conducted by Baugher and Slocombe (1990), Bruening, Hoover and Radhakrusha (1991), Burke (1989), Fletcher and Miller (1995), Forsythe (1983), Gleim and Miller (1992), Gleim and Hard (1988), Hoerner and Bekkum (1990), Johnson and Fletcher (1990), Kasmin, Lawver and Fraze (1993), Lawver (1992), Reece (1980), Swan (1993), and Yohe & Dunkleberger (1992), items for the instrument were selected and modified by the researcher from these studies.

The instrument was reviewed and revised by a panel of experts consisting of faculty from the departments of Agricultural Education, Communications and 4-H Youth Development, Biosystems and Agricultural Engineering and Education Administration and Higher Education at Oklahoma State University. The instrument was further reviewed and critiqued by the State and District staff of the Agricultural Education Division of the Oklahoma Department of Vocational and Technical Education.

The revised instrument was examined by the panel of experts and judged to be valid. To further ensure validity of the instrument, it was pilot tested at three programs in the vicinity of Stillwater, Oklahoma. The District Supervisor of the Tulsa PI Group accompanied the researcher to the pilot tests to identify potential problems with the instrument and the data collection process. Further research and analysis of the instrument is necessary to determine reliability.

Descriptive statistics (means and percentages) were used in this study. All data were processed with Excel version 5.0 on an IBM compatible computer.

Results and/or Findings

The initial research objective was to describe demographic data. Figure 1 indicates the percentages of teachers utilizing selected demographic topics. This revealed that only 7 teachers (21.21%) had taken a safety specific course in college while 9 (27.27%) were chemical handling certified, 10 (30.30%) had taken a safety course from Business and Industry and 21 (63.63%) received safety training from the Professional Improvement Group. The vast majority of the teachers 32 (96.97%) were male, while only one was female. The distribution of teachers by years of experience indicated a seemingly stable distribution through the various groupings except that the 25+ years of experience range had only 3 (9.10%) of the teachers.

Agriculture program demographic data is shown in Figure 2. Nearly three-fourths of the programs had one teacher while one-fourth had two teachers and one (4.17%) had four teachers. Facilities are overwhelmingly over 15 years of age and one program has a facility that is under 5 years of age while only three are between 6 and 15 years old.

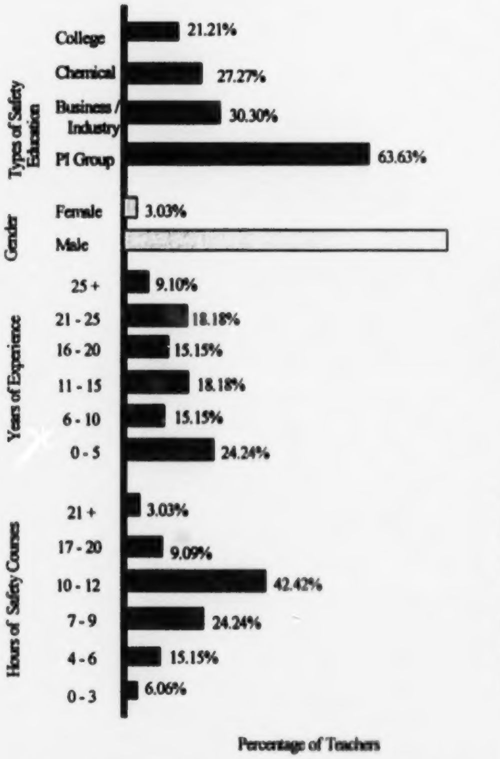

Figure 1. A Summary of Findings as to Selected Demographics of Teachers

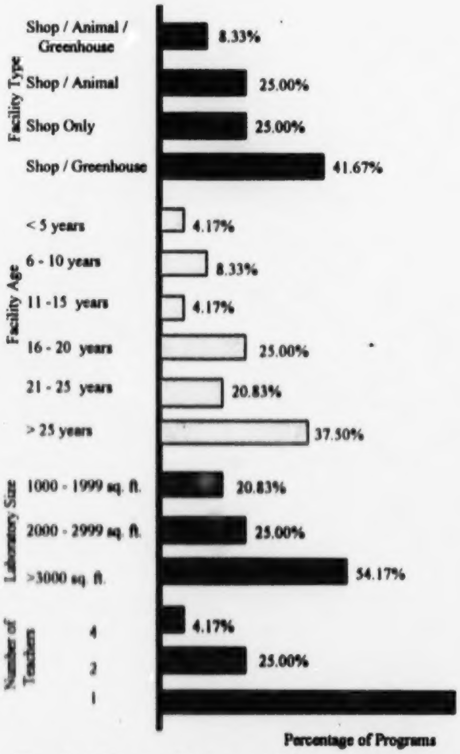

Figure 2. A Summary of Findings as to Numbers of Teachers in each Program, Laboratory Size, Facility Age and Facility Types

Objective 2 sought to determine the safety policy and procedures utilized in the selected agricultural education programs. In terms of the overall documentation of safety procedures, only 12.5% had a written safety plan, 25% had documentation of safety violations and 25% had a written safety enforcement policy. The data further indicated that a great majority (91.67%) had filed accident reports. Only half of the programs utilized the teacher's gradebook to document teach / reteach procedures and 79.17% indicated that lesson plans were used as a documentation procedure. All of the programs kept student safety exams on file and 91.97% used the gradebook to document safety grades. All of facilities and equipment were inspected by the teachers, 91.67% by the district supervisor and 83.33% by a school administrator.

Figure 4 shows the percentages of programs teaching method types, instructional requirements and safety topics covered. Computer programs are employed least often with 12.5%, resource people 45.83% and field trips 54.17%. Student and teacher demonstrations are used as teaching methods in 91.67% and 100% respectively. Safety tests and the 100% mastery of these tests are practiced in all programs while a teach / reteach method is found in 75% of the programs.

All of the programs include tool and equipment safety topics during instruction. Only 4.17% include first-aid as part of the safety instruction. Biohazards / animal safety and chemical safety is part of the safety instruction in 58.33% and 62.50% respectively.

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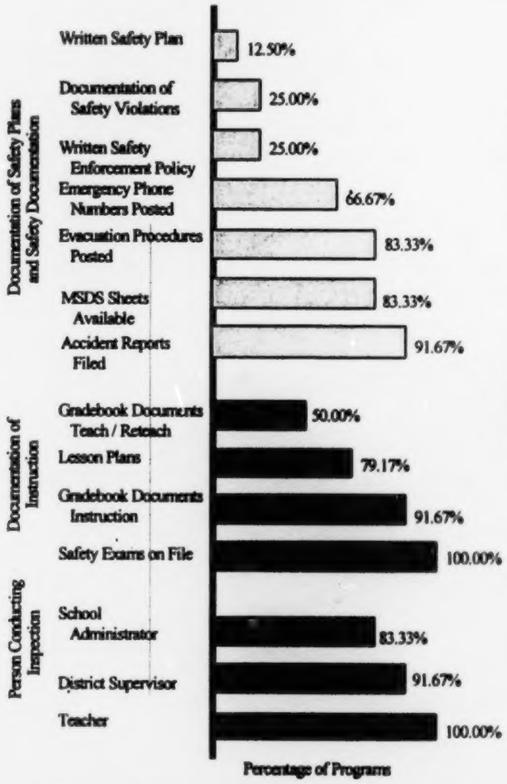

Figure 3. A Summary of Facility Inspection Practices, Safety Plans, and Documentation of Safety Instruction

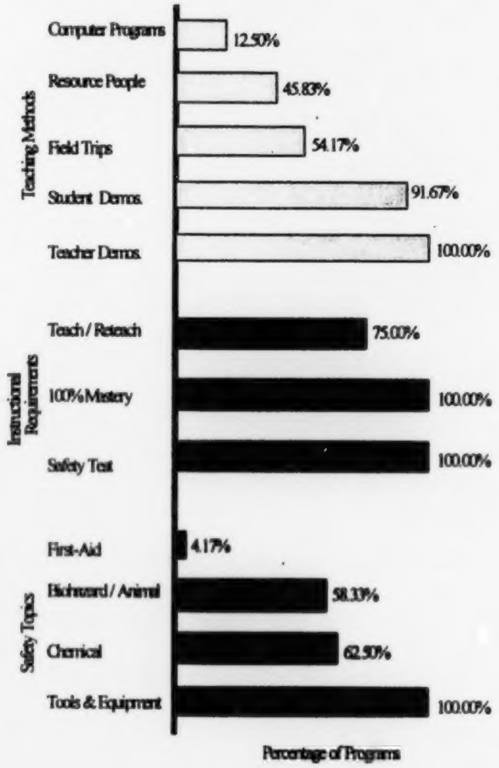

Figure 4. A Summary of Findings as to Safety Topics, Instructional Requirements and Safety Teaching Methods

Objective 3 sought to determine the extent of compliance with recognized safety standards. Housekeeping and facility standards are illustrated in Figure 5. The most obvious findings were that 33.33% of the facilities had cylinders properly stored and only 66.67% had chemicals properly stored. Three-fourths of the facilities were neat, clean and orderly and 91.67% had both material safely stored and aisles free of obstructions. All of the facilities had a clean washing area and walls which were free of possible falling objects.

All of the selected programs had a minimum of two exits, sufficient lighting and had drive mechanisms guarded. Adequate ventilation and safe arrangement of equipment was identified in over 90% of the cases. The data revealed that safety lanes (66.67%), fire resistant curtains (66.67%), fire resistant cabinets (45.83%) and exhaust systems (41.67%) were identified in the facilities. Surprisingly, only 4.17% had nonskid surfaces and 33.33% had safe stairways.

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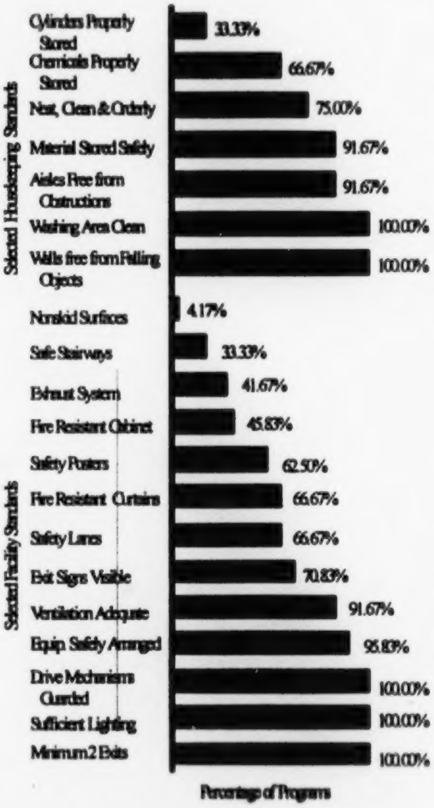

Figure 5. A Summary of Extent of Compliance with Selected Facility and Housekeeping Standards

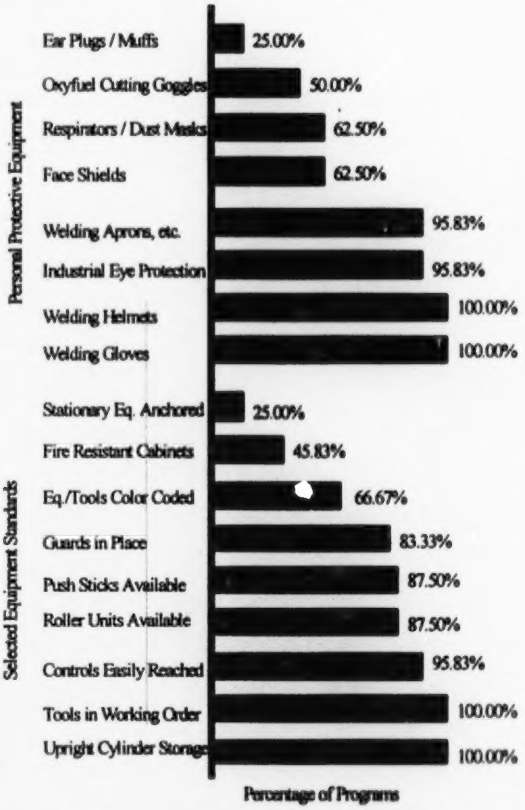

Figure 6. A Summary of Use and Availability of Selected Facility Equipment and Personal Protective Equipment

Percentages of the programs personal protective equipment and equipment standards are shown in Table 6. Only one-fourth had ear plugs / muffs available while one-half offered oxyfuel cutting goggles as a safety item. Almost two-thirds (62.50%) had respirators / dust masks or face shields accessible for students safety. The most widely available equipment was welding aprons and industrial eye protection with 95.83% each. All the facilities had welding helmets, welding gloves, upright cylinder storage and tools in proper working order. Push sticks and roller units were identified in 87.50% of the facilities while 83.33% had all guards in place. Equipment and tools were color coded in 66.67%, fire resistant cabinets in 83.83% and stationary equipment was anchored in only 25% of the facilities.

Figure 7 summarizes the data concerning fire protection, electricity safety protection and first-aid resources. This data indicates that 20.83% have a fire alarm switch, and that combustible waste containers and safety cans are used in 62.50% of the facilities. Just over 91% have a fire blanket available and have the fire extinguisher locations identified while 95.83% have all extinguishers within 75 feet. Power rooms and electrical cabinets were found to be locked in only 4.17% of the facilities while 8.33% used GFCI electrical cords and only one-half had electrical boxes properly covered and circuits identified. Nearly all (94.83%) had UL approved extension cords. All facilities had the equipment properly grounded.

Just 12.5% had an emergency shower available, three-fourths of the programs had a person other than the teacher readily available to render first-aid, 79.17% had an Agriculture teachers with first-aid training while 87.50% had available a working eye wash. Nearly all (95.83%) had first-aid supplies in the facility.

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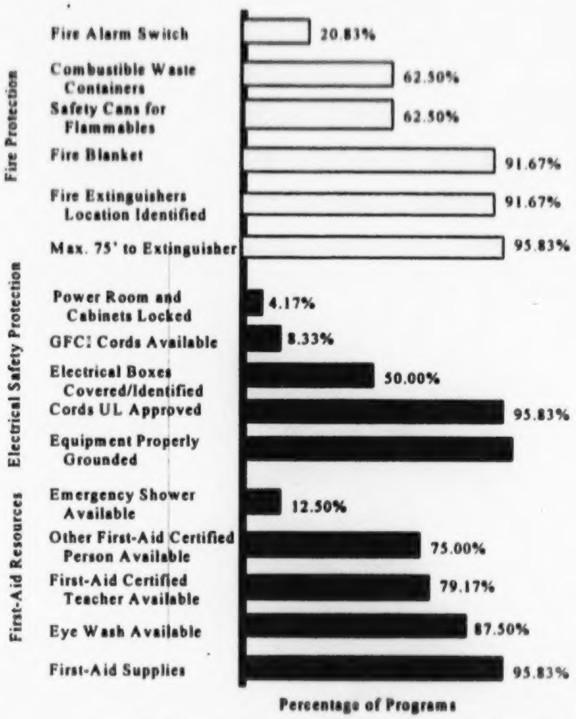

Figure 7. A Summary of Use of First-Aid Resources, Electrical and Fire Protection

Conclusions

The findings are consistent with studies in Missouri (Lamb, 1984), Ohio (Gleim & Hard, 1988), Iowa (Hoerner & Bekkum, 1989), Virginia (Burke, 1989), Mississippi (Johnson & Fletcher, 1990), Kansas (Baugher & Slocombe, 1990), Texas (Lawver, 1992), North Dakota (Swan 1992) and Louisiana (Fletcher & Miller, 1995). It is apparent that the teachers in the programs within this study are cognizant of the importance of safety education and are attempting to provide safe environments for their students. However there are a substantial number of concerns and conditions which need to be addressed immediately.

The teachers are relatively young and for the most part early in their teaching careers. They are primarily located in single teacher departments with somewhat aged facilities. Furthermore, teachers have rather limited formal safety training history and this is found to be a major weakness. Training was obtained primarily through programs offered by the Professional Improvement Group, although some have utilized programs from business and industry.

Local teacher, school administrators and the Agricultural Education District Supervisor monitor the safety programs through regular visitations and for the most part were in conformity with accepted safety administrative procedures with regard to testing, posting information and documenting student knowledge of safety. However, there are areas of concern regarding use of written safety enforcement policies, written safety plans, documentation of safety violations and documentation of teaching / reteaching of safety topics.

Instruction relating to tools and equipment safety is receiving the greatest amount of emphasis in these programs by means of demonstrations and classroom teaching. Resource people, field trips and computer aids are largely overlooked as methods of safety instruction. Biohazard, animal and chemical safety are taught to a

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much lesser degree and first-aid instruction is inadequate. Programs meet most of the selected standards regarding the availability of first-aid.

The standards concerning the general physical conditions of facilities are met in only a few areas. Minor problems exist in areas such as providing exit signs, safety posters, safety lanes and the use of fire resistant curtains. Serious shortfalls exist in the availability of fire resistant cabinets, exhaust systems and proper stairways. Furthermore, the most basic housekeeping standards were adequately met. However, there are deficiencies with regard to storage of chemicals and oxyfuel cylinders and provision of non-skid walking surfaces which should be immediately addressed.

Programs are meeting the selected equipment standards, with notable exceptions being anchoring and color-coding stationary tools and equipment and use of fire-resistant cabinets. There is insufficient compliance with electrical safety standards associated with covered outlets and switches, locked electrical cabinets or power rooms and Ground Fault Circuit Interrupters for use in greenhouses, animal facilities and outdoors.

There are some major shortcomings in meeting selected standards relative to personal protection equipment. In many of the programs, there is need for face shields, dust masks, respirators and oxyfuel cutting goggles. Equipment for protection from noise is almost universally lacking.

Adherence to fire protection standards is generally appropriate, with deficiencies existing in providing safety cans for flammables, covered waste containers and fire alarms within the facility. Teachers are also utilizing safety curriculum materials available to them, as well as supplementing these materials with outside information. Teachers perceive that their tools, equipment and facilities are inadequate and additional funding is necessary to make improvement.

Recommendations

The following recommendations are made based on the results of this study:

1. The Agricultural Education Division of the Oklahoma Department of Vocational and Technical Education continue offering safety training and technical updates on tools and equipment safety, repairs and maintenance. Instruction should be given on chemical safety and biohazard / animal safety. It would be advantageous to develop these programs in cooperation with Business and Industry and Oklahoma State University.

2. Develop a safety specific college level course as a requirement for graduation with an Agricultural Education teaching degree option. Among topics of concern should be first-aid, chemicals, biohazard / animal safety, tools and equipment, electrical, air quality and noise safety, as well as, teaching metrologies, safety documentation and legal aspects of safety education.

3. A detailed list of expectations regarding safety policies, practices and procedures needs to be immediately developed and made available to the Agricultural Education teachers and School Administrators.

4. The Agricultural Education Division Supervisory staff should immediately develop a written safety plan and detailed documentation system for utilization state wide in order to properly manage the safety program.

5. It is apparent that the safety curriculum materials must be modernized and updated. Instructional aids in the form of computer-aided instruction, safety posters, safety rules and an emphasis on safety specific field trips, video programs and resource people needs to be included.

6. All teachers in the state should be first-aid certified as part of the Agricultural Education Division Professional Improvement Group updates and as part of the preparation for undergraduates within the Agricultural Education teaching option.

7. Additional funding needs to be made available and targeted at tool, equipment and facility modernization and that special emphasis be placed upon identifying and removing dangerous tools and equipment form facilities. Furthermore, emphasis needs to be placed upon providing personal protective equipment, fire protection and tools and equipment maintenance.

8. Attention is necessary to overcome problems with electrical safety, availability personal protective equipment and fire protection. Provisions for locked chemical and fire proof storage cabinets and locked electrical power cabinets and rooms should get immediate emphasis.

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AAAE Poster Abstracts

Enhancing Professional Development For Agricultural Education Students

Jason D. Haak, Lincoln-Way High School, Frankfort, IL
Jerry L. Peters, Purdue University
Kirk A. Swortzel, Auburn University
B. Allen Talbert, Purdue University

Rural Citizen Perspectives on Michigan Groundwater: Findings from Focus Group Interviews

Dave Krueger, Michigan State University
Rachael Post, Michigan State University
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It Really Works!! Highlighting the success of the Single-operator, Multimedia, Video-capture Classroom Learning Center

Jack Elliot, The University of Arizona
Dan Clark, The University of Arizona

Establishing the Need for Agricultural Health and Safety Programs for Utah Youth

Richard M. Joerger , Utah State University
Christine Sommers, Utah State University

A World Wide Web Hypermedia Textbook For Improving Instruction In Agriculture

Matt R. Raven, Mississippi State University
Michael E. Newman, Mississippi State University
Gary Moore, North Carolina State University
Robert Torres, New Mexico State University
Jim Flowers, North Carolina State University
Gary B. Jackson, Mississippi State University

Improving Instruction In A College Of Agriculture

Michael E. Newman, Mississippi State University
Timothy N. Burcham, Mississippi State University
Matt R. Raven, Mississippi State University

Student Teacher Website in Agricultural Education: Using the Internet as a Communication Resource

Michel T. Brashears, Oklahoma State University
Anissa Wilhelm, Oklahoma State University
Bill Weeks, Oklahoma State University
Robert Terry, Jr., Oklahoma State University

Enhancing Professional Development For Agricultural Education Students

Poster Abstract

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Lincoln-Way High School, Frankfort, IL

Jerry L. Peters
Purdue University

Kirk A. Swortzel
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B. Allen Talbert
Purdue University

Introduction

More agricultural education students in college are coming from non-agricultural education high school backgrounds. Furthermore, agricultural education programs increasingly have students with different career objectives, who are dual majors, who are seeking masters degree certification, etc. Faculty and students have less time to participate in night and weekend activities that would aid in their professional development. There was a need to bring all students together to provide instruction and practice in professional skills, knowledge, and attitudes that all agricultural education graduates need in order to succeed in their careers.

Methodology

A seminar-type course, EDCI 240 - Seminar in Agricultural Education, was developed to address the above issues. The course is offered each semester during the academic year and students are able to take the course each semester that it fits their schedule. It meets for a 75 minute period on Thursdays each week. Students receive one hour of credit and are graded on an A-F scale. Points are awarded through participation in professional, leadership, community service, educational, and social activities. Students submit activity reports and course assignments via e-mail. One staff member is assigned to coordinate the course, but all agricultural education faculty, staff, and graduate students participate.

Course content is rotated each week among committee meetings, seminars, and IVATA-Purdue (the agricultural education student organization) chapter meetings. Each student enrolled is a member of one of four standing committees: Campus and Community; Program and Career Development Events; Awards, Membership, and Finance; and Publicity. Each committee selects a committee chair for that semester. A Program of Activities is developed each spring for the following year and committees use this as their guide. Committees are responsible for coordinating one seminar each semester. The chapter meeting is chaired by the IVATA-Purdue president and is run by the class members.

Results

A typical semester has 75% or more of the agricultural education students enrolled. The course receives high marks on the University standardized course evaluation form. More students are participating in activities than were before the course was started. Students have commented that by participating in this course they:

- receive current, practical information from people in the field,
- earn academic credit for participating in professional development activities,
- learn how to use electronic communications and develop an appreciation for its usefulness,
- associate with all or most agricultural education students from freshmen through graduate students, and
- have regular contact with faculty and staff.

Future Plans

Students have reported that although it is good to learn to use e-mail and that it is easy to use once learned, the University computing system can be cumbersome at times. They report that servers go down, computer labs seem to be always full, and modem lines into the University system are typically busy until well after midnight. Consideration needs to be given to finding alternative methods of teaching students how to use e-mail, providing easier access to the technology, or reducing the number of assignments required using e-mail. There are still students who do not fully participate in all opportunities available to them. We are undecided as to how to get them to take advantage of learning experiences that will help them be better prepared for their eventual careers.

Costs

The course costs approximately $1.00 per student for copying of handouts, etc. Because the course is taught over the lunch hour, there have been semesters that once per month IVATA-Purdue provides lunch which costs $1.00 per student. At the present time, faculty are teaching the course as an overload in addition to their required teaching load.

Rural Citizen Perspectives on Michigan Groundwater: Findings from Focus Group Interviews

Poster Abstract

Dave Krueger
Michigan State University

Rachael Post
Michigan State University

Murari Suvedi
Michigan State University

Introduction

The Michigan Groundwater Stewardship Program was established in 1994 with the passage of Public Act 247 and is administered by the Michigan Department of Agriculture (MDA). It has developed and adapted a program structure to protect Michigan's groundwater and freshwater in coordination with federal agencies including Natural Resources Conservation Service, Farm Service Agency, state agencies such as Michigan Department of Environmental Quality, Michigan State University Extension and professional and industrial organizations. The program promotes farmers protection of groundwater from pesticides and fertilizer contamination. The mission of the Michigan Groundwater Stewardship Program is to provide information and assessment tools to pesticide and fertilizer users to assist them in identifying groundwater risks associated with their land-use practices; and to coordinate private, local, state, and federal resources to reduce those risks. The long-range plan recognizes the need for shifting the programs' efforts toward more direct service to the needs of the public. The program has formulated an integrated approach for demonstration, education, and service which emphasize its primary role as promoter and implementer of safe farming practices.

Program evaluation is an important component of the Michigan Groundwater Stewardship Program. This specific poster presentation documents the findings of focus group interviews on rural citizens perspectives of Michigan groundwater and was prepared to offer the Michigan Groundwater Stewardship Program insights and perceptions about groundwater issues throughout the state. Promotion and marketing of the Michigan Groundwater Stewardship Program resulted from focus group and personal interviews.

Objectives

1. To explain how focus group interviews are used to study citizens perspectives on groundwater stewardship issues.
2. To share how focus group study findings are used in designing educational and cost-share programs for the Michigan Groundwater Stewardship Program.

Methods

A series of focus groups were conducted in six cities around Michigan. The focus groups were conducted in Escanaba, Grand Rapids, Jackson, Kalamazoo, Saginaw, and Traverse City. Participants included farmers, agribusiness representatives, Extension specialists, and others who represent a cross section of our rural community. These individuals were asked to respond to eleven questions designed to elicit opinion on issues important to the Michigan groundwater stewardship.

A random sample was drawn from a list of rural community members from each region. A letter was sent to invite these individuals to join us at a local restaurant or hotel conference room for a free breakfast and discussion on the groundwater quality in their area. In the letter the participants were asked to phone the office and R.S.V.P. Three to four days before the focus group, the assistant moderator called the participants that had not responded. The focus groups ranged from six to ten people, a moderator and an assistant moderator.

The moderator asked questions to the group making sure each participant had an opportunity to express their opinion and kept the focus group moving. The assistant moderator taped the interviews and also took extensive notes. A brief summary was written on the major findings. After the completion of all the focus groups an executive report was developed to summarize all of the sessions.

Findings

Most respondents felt their water was quite good. However, many felt the type of soil and geological soil structure may be a factor for possible problems. Some also commented that the depth of the well or water table played a factor on the quality of the water. Several respondents stated they did not have their water tested, but plan too now. Also many felt there are a concerns with pesticide contamination and nitrate problems, but not in the agricultural community.

The respondents biggest concern expressed was the fear and lack of understanding about potential hazards to groundwater to urban, suburban, as well as rural areas. Some felt that development, commercial lawn care providers, urban waste disposal, and attitudes of those outside the agriculture industry were the greatest concerns. Another concern was how the public perceives farmers and how nonagricultural people felt farmers were to blame for groundwater problems.

When respondents were asked about their awareness of the Michigan Groundwater Stewardship Program most explained they had heard very little about the program. Many knew that a fee was added to the purchase of pesticides, but they did not know how it was used.

Respondents wanted a more comprehensive program that included wellhead protection, land-use planning, fuel storage, and groundwater recharge protection. Respondents suggested economy be the key to designing a program. The program should include incentives to provide assistance. Economics and education should remain two critical components. The program should be user friendly without a lot paperwork.

Recommendations

Since a large number of the concerns involve the lack of communication the program as a whole should be better addressed so everyone can truly understand the program's design and purpose. One way respondents thought the lack of communication could be solved was by developing newsletters or using other forms of media to better explain the Michigan Groundwater Stewardship Program.

Incentives should be offered to encourage farmers to participants in future groundwater protection activities. Also, the groundwater activities and programs should be locally conducted, economical, and non-regulatory.

It Really Works!! Highlighting the success of the Single-operator, Multimedia, Video-capture Classroom Learning Center

Poster Abstract

Jack Elliot
The University of Arizona

Dan Clark
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INTRODUCTION

The Department of Agricultural Education at The University of Arizona has found a solution to the emerging concerns faced by post secondary Agricultural Education programs across the country. These concerns include university minimum enrollment standards, secondary Agriculture teacher shortages and teachers needing resources and technical assistance that will take them into the twenty first century. All of these concerns can be addressed courtesy of the Department's "Command Center" or self contained multimedia learning station.

WHY A SELF CONTAINED MULTIMEDIA LEARNING STATION?

When the Department was faced with these challenges, offering courses over a satellite was considered. Upon further investigation, several pitfalls were discovered.

- The college's distance education room is a sterile studio environment.
- Additional time is required from faculty members to present courses in the studio and in the classroom.
- Teaching techniques are severely limited when classes are taught to a camera instead of a live class.
- Scheduling the studio and time on a satellite can be difficult.
- Satellite access can be difficult to obtain for some "customers."

Determining that this method of delivery was not going to meet the needs of the department or its clientele, an alternative was sought out. A vision of this multimedia learning station had been developing over a period of years. The time was right to make it into a reality.

HAS IT WORKED?

Many teachers and students, because of their remote location or busy schedules, would not have access to classes, emerging information or technology if it were not for the Command Center. The Department has been awarded a Professional Development grant from the Arizona Department of Education. Through this grant, twelve workshops will be offered to vocational educators across the state. Now we are reaching a record numbers of undergraduate and graduate students and educators in the field. As of March first, 53 clients have successfully completed or are completing courses and/or professional development workshops through distance technology.

HOW IT WORKS

Using this system, one instructor can film a class at the university, producing a high quality video that can then be sent directly to off-site participants. Through the learning station the instructor can capture classroom participation, E-mail, Internet, multimedia, video and 3-D image display.

WHAT DOES THE END USER THINK?

Lance Fite, of Safford High School said, "If it weren't for the new distance classes, I wouldn't be able to get my Masters in Ag Ed." He also said, "One real benefit of watching the classes on video tape, is I can watch it when it is convenient for me. Most of my questions can be answered by rewinding the tape and watching it again. Now I can't do that in a live class, now can I?"

EQUIPMENT NEEDED

This system utilizes several pieces of equipment obtained through many different sources. The strength of this system is its ease of operation, flexibility/portability and use of existing equipment.

Feature	Function(s)	Source
Multimedia computer with Internet capability	Presentation software, Internet instruction, word processing and statistical programs	Agricultural Technology Management Major Enhancement Grant
LCD Display Panel	Display computer and video images onto a screen	J. Elliot start-up funds
Overhead Projector	Light source for LCD Panel, project transparencies onto screen	Department equipment
Elmo Visual Presenter	Capture 3-D images, transparencies, paper, slides, video presenter and class and acts as a switch between mediums	Classroom enhancement grant
VHS Video Camera	Capture video of presenter and class and feed the signals to Elmo	Department Equipment
Stereo Sound System	Record voces of presenter, class, play CDS, play audio tapes, feed the signals to tape	Distance Learning Grant
VHS Video Recorder	Record all signals to a VHS tape	J. Elliot start-up funds
Cart	Hold computer, overhead, Elmo, VHS recorders, stereo system, LCD panel. Designed and organized to be portable and very user friendly.	Distance learning grant and B. Foster start-up money

Establishing the Need for Agricultural Health and Safety Programs for Utah Youth

Poster Abstract

Richard M. Joerger
Utah State University

Christine Sommers
Utah State University

Introduction

The industry of agriculture continues to be one of the top three most dangerous industries in the United States. Because of the proximity of the home, play areas, and need for child labor, many of our children are continually exposed to the hazards of farming and ranching. Unfortunately, the number of agricultural injuries experienced by children is very high. Murphy (1992) reported that 24% and 14% of the total agricultural injuries in Minnesota and Indiana, respectively, were experienced by children 15 years of age or younger. Fatality rates are equally alarming. Runyan (1993) reported an annual death rate of 3.2 and 1.5 deaths per 100,000 workers, respectively, for Wisconsin and Illinois from 1979 to 1985. Utah children under 16 years of age made up 30% (28) of the deaths from 1987 to 1995.

The magnitude of this problem is being recognized and addressed by many in the medical and agricultural professions. In 1996 The National Committee for Childhood Agricultural Injury Prevention responded to the number of agricultural injuries by generating specific recommendations for research, education, policy and evaluation. Likewise, the National Farm Medicine Centers, the National Institute for Occupational Safety and Health, Extension Service, and the National FFA through the newly initiated *Partners for a Safer Community* program are focusing efforts on reducing the number of youth injuries in agriculture. In addition, existing research findings and corresponding educational programs designed to reduce youth injuries are showcased on the World Wide Web by a select group of researchers and program leaders from a limited number of universities and agencies.

To date Utah has not determined the number, causes, and nature of injuries experienced by rural youth. Once these data are determined, appropriate off-the-shelf or custom-designed curriculum can be used to meet the specific needs of Utah youth.

Purpose and Objectives

The purpose of this project was to determine the agricultural injury rates for Utah children from ages 1 to 16. The objectives that guided the study were to: (a) describe the number and types of agricultural injuries experienced by all ages of rural Utahns.; (b) describe the causes of injuries experienced by Utah youth; (c) describe the nature of injuries experienced by Utah youth, and
(d) describe the parts of the body injured in Utah agricultural accidents.

Procedures

The data used for this study were extracted from a five year statewide data set of agricultural injuries compiled by Niederee (1993), Egbert (1992) and Schenck (1989) at Utah State University. The database consisted of over 3800 validated agricultural injuries treated in emergency rooms of 24 rural Utah hospitals from 1989-93.

Results

Livestock caused 54% (604)of the youth injuries treated in Utah's 24 rural hospital emergency rooms from 1989-93. Rural-based injuries accounted for 30% (340) of the total, and machinery were the cause of 16% (179) of the agricultural injuries. Children from 0 to 16 years of age experienced 29.8% (1123) of all recorded injuries. The leading causes of the injuries, in order, were horses (501), fences and fencing (127), and tractors (43).

In order, the nature or type of injuries were fractures (250), major cuts (191), minor cuts (100), and bruises (169). The top five body parts that were injured, in order, were the head (134), arm (128), foot (120), leg (98), and fingers (80).

Conclusions

The results from this study indicate livestock, and especially horses, are the primary cause of youth injuries in Utah. Further, fences and fencing are a secondary cause of a large number of injuries. Tractors, like in many states, are a third major cause of injuries. These results indicate that corresponding instruction needs to be obtained and/or developed to address these causes of agricultural injuries in Utah. First aid procedures and use of personal protection devices should be addressed in the instruction as a strategy to care for and limit the number of injuries to the upper body and extremities of Utah children. Delivery of this instruction can likely take place through the middle and secondary agriscience and technology programs, FFA, 4-H, Extension, and special programming opportunities afforded by organizations such as the Farm Bureau and Farm Safety Just-for-Kids.

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A World Wide Web Hypermedia Textbook For Improving Instruction In Agriculture

Poster Abstract

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Introduction

Teaching is crucial to the mission of Colleges of Agriculture. Today we are seeing a renewed emphasis on teaching in many universities. A critical question is where do faculty go for help to improve their teaching. Some university teaching improvement centers do exist but they tend to be generic in their approach, may not be readily accessible, and not all universities have them.

When a department head tells a faculty member that a course syllabus is inadequate, or the professor needs to work on gaining the studentsÆ attention, or that test items are poorly worded, where does the professor go for help? There is a need for a convenient, accessible source of information that agriculture professors can use to improve their teaching.

Purpose

The solution is an interactive, hypermedia electronic textbook on the World Wide Web that focuses on effective teaching in agriculture and the life sciences. The purpose of this project is to improve the teaching of agriculture through the development of such a text. The three specific objectives of the project are to:
Identify the pedagogical skills and knowledge needed by university teachers of agriculture

Develop instructional materials based upon these needs, and
Place these materials on the World Wide Web in an interactive ôtextbookö format.

This project was funded as a United States Department of Agriculture Higher Education Challenge Grant with Mississippi State University, North Carolina State University, and New Mexico State University.

Method

A panel of nationally recognized teachers from various agricultural disciplines were used to identify the topics included in the electronic college teaching text. Project team members from North Carolina State University, New Mexico State University, and Mississippi State University are developing units for the electronic textbook. The following units were identified:

Developing Critical Thinking Skills
Improving Presentation/Classroom Skills
Motivating Students to Learn
Using the World Wide Web in Instruction
Lecturing Successfully
Research on Effective Teaching
Test Construction
Alternatives to Lecturing
Learning Styles
Issues in Higher Education

Laboratory Instruction
Preparing and Using Visuals
Course Planning and Development
Designing and Evaluating Student Assignments
Diversity and Related Issues
Lesson Planning
Teacher Evaluation
Advising Students

The expertise of the faculty were used to determine who would develop which chapters. The developed chapters have content, hypertext links, interactive pretests and posttests, and where appropriate, brief video vignettes and audio vignettes. These materials are currently being placed on the World Wide Web at: http://www.ais.msstate.edu/MTAP/index.html

The electronic textbook will be field tested initially with graduate students at three universities and then with agriculture faculty and students at a number of universities. Dissemination of the project will occur through demonstrations of the electronic textbook at meetings of agricultural professors and administrators, through postings on electronic bulletin boards, through the mailed distribution of brochures to all institutions of higher education teaching agriculture and by listing the course in the World Lecture Hall website at the University of Texas.

Projected Outcomes

There are three main values to be derived from this project. The first is improved teaching. Professors, graduate students, extension agents, and others will be able to access the material and participate in interactive activities designed to improve their teaching. They can participate in the entire range of activities or concentrate on areas in which they feel they have the greatest need.

The second value of the project is to reduce duplication of effort. Considerable time and effort will be required to develop this electronic textbook. Since improvement of teaching is a concern at nearly all universities, other institutions will be able to use this information without ôreinventing the wheel.ô This can result in cost savings and utilize existing resources for other high priority items at many universities.

The third value is the ômodelingô effect of this project. Professors will be exposed to the concept of on-line learning and can then place their own courses on-line. The potential implications of this are far reaching. Professors will also be more likely to use other materials that are on-line.

This project should facilitate discussion among higher education faculty on how to improve teaching and provide concrete materials and examples that professors can use to improve their own teaching. The improvement of teaching will strengthen higher education in the food and agricultural sciences in the United States.

Improving Instruction In A College Of Agriculture

Poster Abstract

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The World Wide Web (Web) is the fastest-growing information medium available today, with huge implications for higher education into the 21st century. The Web is quickly becoming the information lifeline for scientists around the world. Currently, over 24 million people in the U.S. use the Web, and the number of users is increasing by over 1 million per month. Unfortunately, much of the power contained on the Web is untapped due to a lack of implementation in the classroom. University students are quickly learning how to access information over the Web, and they will expect their professors to incorporate the Web into their instruction.

Agriculture professors vary widely in their use of technology for classroom instruction. While most have outstanding knowledge of the subject matter, some obviously do a better job of sharing that knowledge with students and others. Whether they are good teachers or bad, most are willing to improve their instruction when given an opportunity. Many become frustrated and intimidated with the technology. They know an opportunity exists, but they don't know how to take advantage of it. Such is the case with hypermedia. Faculty have heard of the Web and other presentation possibilities, but generally don't know how to get started in developing materials for use in their classrooms and by their students.

At present, few agriculture professors have the expertise needed to make effective use of this medium. In a survey conducted at Mississippi State University (MSU), College of Agriculture and Home Economics faculty indicated a willingness to use the Web, but indicated a strong need for new equipment and inservice training to help them learn how to do so. Both sections of a multimedia/html authoring workshop were filled at the beginning of the school year, but the laboratory used for the workshop is devoted to student use. The workshop served the purpose of getting faculty interested in hypermedia, but due to lack of equipment and support, little real improvement of instruction was accomplished. Faculty indicate a need to learn much more and to practice with some supervision and assistance. As stated in Internet World, education is the key ingredient for helping someone take advantage of what the Web has to offer.

This project is designed to develop a model hypermedia laboratory for enhancement of Web-related instruction in agriculture. The authors proposed a computer laboratory with appropriate peripherals and personnel support to teach agriculture professors how to develop and use interactive, hypermedia technology in their instruction. The project was funded by the USDA Challenge Grant Program for two years. The project began in September 1996 and will continue until September 1998.
Project Activities

Project personnel will provide faculty with both the means and the assistance needed to make use of this technology. Specific objectives of the project are to: 1) organize a 10-station computer laboratory with appropriate peripherals for hypermedia-based instructional materials development; 2) create a website for development of hypermedia-based instructional materials; 3) teach seminars to faculty on development of hypermedia-based instructional materials; and 4) provide ongoing support for faculty as they develop their own hypermedia-based instructional materials. Of these, the computer laboratory has been organized; the website begun, and the seminars will start during March 1997.

Project Outcomes

The benefits of the project are obvious. Faculty will be able to enhance instruction in the classroom by using new and developing media. This will allow them to develop instructional modules that take into account the various learning styles of students. Faculty will be able to share their expertise with students and others by making their course content available via the Web. Students will benefit by learning to use the technology available within the context of their coursework. Students will also have increased access to the course content because it will be available not only in class, but also whenever they want it outside of class via the Web. This project will provide a model for other colleges of agriculture to follow for their faculty development efforts in this area. Other colleges of agriculture will be able to access the website that will be developed for the project. Information at this website will include complete lab specifications, seminar content in the form of interactive hypermedia modules, examples of instructional websites, links to other related websites, on-going news concerning the use of hypermedia-based instructional materials in agriculture, and as a means for contacting the investigators of this project for assistance. Additionally, the professors who have completed the seminars and begun using the technology will form a core of technology-competent professors--each department will have their own experts that others can go to for help.

Initially, the products of this project will be disseminated primarily via the Web, the fastest-growing dissemination media in the world. New Web technologies will provide for a higher degree of interactivity than ever possible. Other colleges of agriculture wishing to follow the model established by this project will have the means to acquire all the benefits of this project except for the equipment and direct supervision. The website will enable faculty from other colleges of agriculture to interactively participate with the content of the seminars. Additionally, the website will be an invaluable resource for agricultural professors trying to locate examples of what other agriculture faculty are doing. Emulating model websites is a common form of website development.

As the project develops further, demonstrations of the project will occur at regional and national meetings of agricultural professors and administrators, by mailing an announcement brochure to each of the universities in the U. S. with a college of agriculture, and by placing electronic mail messages on Internet mailing lists, newsgroups, and bulletin boards.

A Student Teacher Website in Agricultural Education: Using the Internet as a Communication Resource

Poster Abstract

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Introduction/Need

Each semester, student teachers are placed at various locations throughout the state of Oklahoma. During that time, the student teachers experience first-hand the day-to-day routine of an agriculture instructor. While out on-site, the amount of contact that student teachers have with one another and with university professors is greatly reduced. Current resources available to student teachers while on site are the cooperating teacher, limited contact with the university supervising teacher, and other materials. With recent technology, it has also become possible for student teachers to increase their resource base through use of computers and the Internet.

The opportunity to provide more student teacher-to-student teacher communication and quicker and easier access to university instructors prompted the development of a website designed specifically for OSU student teachers. One of the methods to bridge the gap between individual opportunities that are available in the student teaching experience and cooperative learning opportunities, is the use of communications through the Internet. This method provides the possibility of immediate access to information and the exchange of ideas between the student teachers themselves and university professors and graduate students.

How it works

Prior to reaching the student teaching site, students are enrolled in AGED 4103, a four-week block session. During that session, students are exposed to different methods of instruction, participate in workshops and participate in practice lessons. Students are able to receive feedback from other students as well as the instructors. The students can continue this peer relationship through the website.

The website for student teachers, Oklahoma Agricultural Educators Website, is part of the AGED 4103 class homepage (http://www.okstate.edu/OSU_Ag/agedcm4h/academic/aged 4103/aged 4103.htm). Students are able to access lesson plans, calendars, FFA chapter lists and homepages, and other student teachers via e-mail. All students enrolled at Oklahoma State University are assigned an e-mail account. Through the use of e-mail, student teachers are able to communicate with one another and university professors and graduate students.

Current progress

The Oklahoma Agricultural Educators Website began in the Spring 1997 semester. As with most websites, it is continually under revision to provide needed information for student teachers. Currently, the website offers links to other agriculturally related sites, a message board, chat room, downloads, lesson plans, and student teacher information.

What changes are planned?

Future plans include a follow-up review to determine the usefulness of the website by student teachers, as well as a continual effort to expand and improve the overall site. The main area of expansion will focus on the lesson plan archive as we try to find useful, current information for the student teachers. We would also like to determine the feasibility of adding a chat room for student teachers to communicate in real time. As the student teachers utilize the website, it provides the opportunity for use by the cooperating techers as well.

Costs/Resources

This website was developed as a special project by a graduate student. Essentially, the idea was developed by the graduate student and the faculty members responsible for student teachers. Through coordination with the individuals responsible for the Agricultural Education, Communications, 4-H Youth Development department server, the website was established.

Cost was minimal as the website is part of the Agricultural Education, Communications, 4-H Youth Development homepage. As this is a website that is currently under further construction and changes are foreseen, the website will require maintenance beyond the initial development stage. Maintenance can be provided by the faculty members responsible for student teachers or possibly a graduate student working with that faculty member.